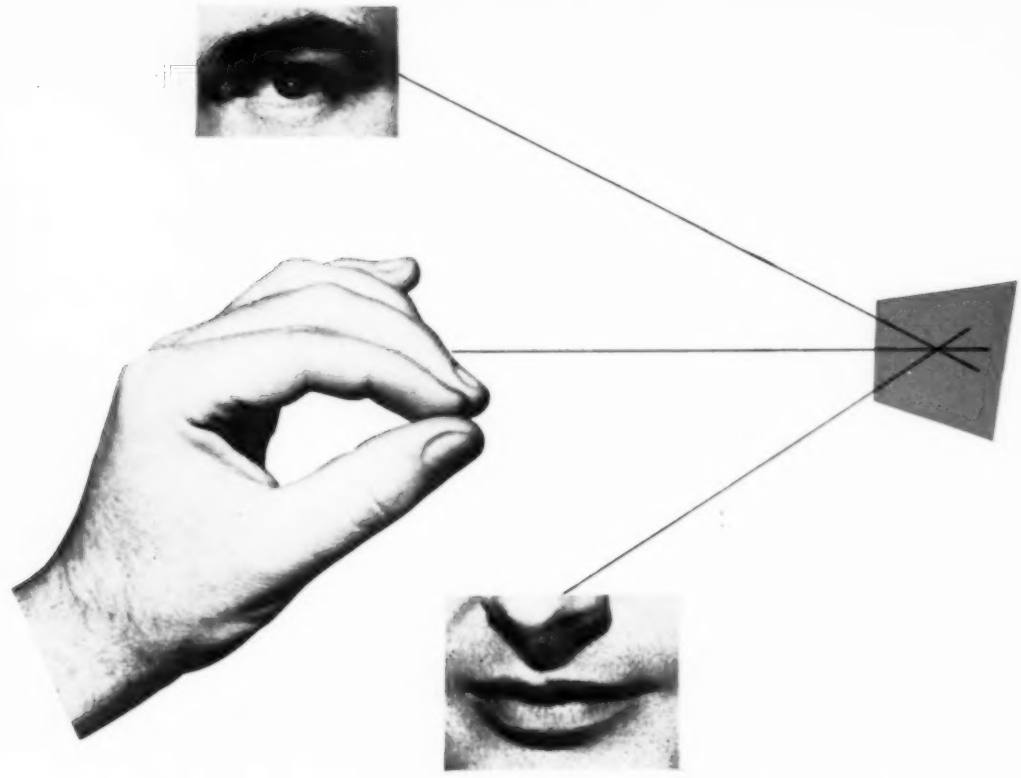
Vol. IV, No. 11 NOVEMBER, 1949

AGRICULTURAL CHEMICALS

In This Issue:



what does insecticide **QUALITY** *feel like?*

Is it clear to the eye?...pleasant to touch? Possibly, but quality goes a lot deeper. Take POWCO BRAND quality, for example:

- **POWCO BRAND** Powders are ground to *micron-size fineness*...permits admixing without additional grinding...assures uniform distribution.
- **POWCO BRAND** Wettable Powders disperse swiftly in water...maintain long suspension.
- **POWCO BRAND** Liquid Concentrates consist of precise ratios of solvent and solute for *long-lasting clarity*...filtered too, insuring *sediment-free* solutions.
- **POWCO BRAND** Emulsifiable Concentrates contain exactly the right amount and type of emulsifier—not enough to become *too* stable—just enough to assure complete emulsification with quick-breaking characteristics.

You can *feel* the results of these POWCO BRAND qualities in your own operation, and you'll agree—it's a nice feeling!

CHLORDANE POWDERS AND LIQUIDS
DDT POWDERS AND LIQUIDS
ANTU
PYRETHRUM POWDERS AND EXTRACTS
PYRINS
PYRISCENTS (insecticide perfumes)
AEROSOL FORMULATIONS
2,4-D AND INPC WEED KILLERS
BOTANICALS • ROTENONE • SABADILLA
STIMTOX A
COTTON DUST CONCENTRATES
BHC POWDERS AND LIQUIDS
TOXAPHENE POWDERS AND LIQUIDS
TETRAETHYL PYROPHOSPHATE

John Powell & Co., Inc.

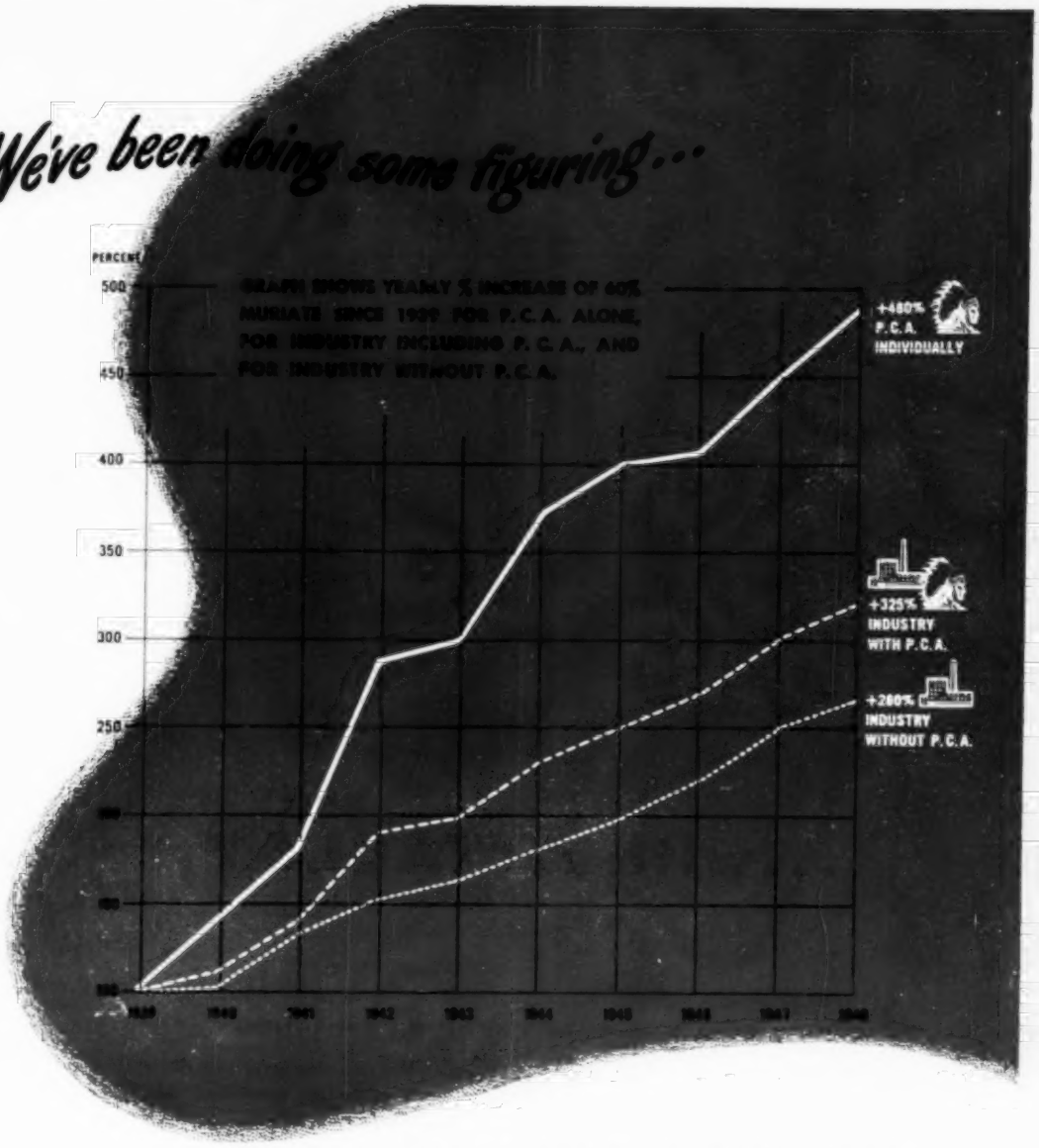
ONE PARK AVENUE, NEW YORK 16, N.Y.

Sales Offices: Chicago · San Francisco · Pittsburgh · Philadelphia · Fort Worth
Canada: Charles Albert Smith, Ltd., Toronto, Montreal · In Argentina: John Powell y Cia
Representatives in Principal Cities of the World

powco BRAND

KILLING POWER—THAT'S THE THING!

We've been doing some figuring...



1948 was a record year for domestic Potash. Using '39 as a base, the industry—not including P.C.A.—showed an increase of 280% in 60% Muriate. P.C.A. production lifts the industry increase to 325%. ***P.C.A. alone shows a High Grade Muriate increase for the same period of 480%.***

95% of all P.C.A.'s '48 deliveries were in the form of 60% Muriate. Our new $4,000,000 production and refining facilities now are operating. Our deliveries for '49-'50 will break all previous records. In fact, P.C.A.'s production capacity for 60% Muriate this year will exceed by some 150,000 tons the entire potash consumption — all grades — of the nation ten years ago.

These figures are graphic evidence of the leadership P.C.A. has won . . . leadership in volume, in economy to you and to agriculture.

P.C.A. — The SALT of the EARTH — RED MURIATE

Potash Company of America
Carlsbad, New Mexico

GENERAL SALES OFFICE . . 50 Broadway, New York, N. Y. • MIDWESTERN SALES OFFICE . . First National Bank Bldg., Peoria, Ill.
SOUTHERN SALES OFFICE . . Candler Building, Atlanta, Ga.

Be Penny-wise and Pound-wise, too

...with ATTACLAY

YOU'RE penny-wise when you choose a carrier or diluent that cuts the cost of producing pesticide dusts. And you're pound-wise, too, when you select the material which serves to up-grade the quality of every pound of your product. You're *both* penny-wise and pound-wise when you specify Attaclay.

Attaclay's superior flowability keeps dust production moving at a faster pace. It accepts higher percentages of difficult-to-process toxicants. It stays dry and **loose**—permits mills to operate up to **50%** longer between cleanings.

The fluidity of Attaclay-mixed dusts streamlines packaging operations. And months later, when packages are opened, your product is still loose and lump-free.

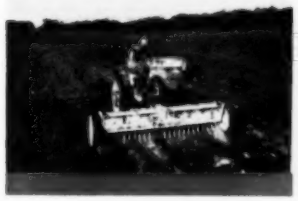
Attaclay's record of over-all compatibility is soundly established. Its low bulk density works to your advantage.

We invite you to put Attaclay to your most exacting tests. A generous free sample is yours upon request.

ATTAPULGUS CLAY COMPANY

Dept. P, 210 West Washington Square, Phila. 5, Pa.

AGRICULTURAL CHEMICALS



THIS MONTH'S COVER

Applying mixed fertilizer on cover crop is one of end uses of the nearly 20,000,000 tons of fertilizer used annually in the U. S. Replacing nutrients removed from soil by harvested crops, leaching, etc. is basic. See article on page 33, this issue. (Photo courtesy Seabrook Farms, Bridgeton, N. J.)

NOVEMBER 1949
VOL. IV No. 11

In This Issue:

AGRICULTURAL CHEMICALS

Subscription Rates: *One year,* $3.00; *two years,* $5.00. *Outside U. S. one year,* $4.00. *Published monthly on the* 15th *by Industry Publications, Inc. Publication office,* 123 *Market Place, Baltimore* 2, *Md. Advertising and editorial office* 254 *W.* 31*st St., New York* 1, *New York. Advertising rates made known on application. Closing date for copy—*20*th of the month previous to date of issue.*

Entered as second-class matter November 4, 1949, at the Post Office at Baltimore, Md., under the Act of March 3, 1879.

A Monthly Magazine For the Trade

LAWRENCE A. LONG
Editor

THOMAS MORGAN
Advertising Manager

Editorial Advisory Board . . .

DR. ALVIN J. COX
Palo Alto, Calif.

LEA S. HITCHNER
Washington, D. C.

DR. S. E. A. MCCALLAN
Yonkers, N. Y.

DR. CHARLES E. PALM
Ithaca, N. Y.

DR. S. A. ROHWER
Washington, D. C.

DR. COLIN W. WHITTAKER
Washington, D. C.

A farmer's whole tobacco crop depends upon a good supply of healthy plants for field setting. Those above were sprayed regularly to prevent blue mold.

Here's what blue mold can do to a bed of unprotected tobacco plants. The grower had to buy plants at additional cost of time, labor, and money.

Blue Mold Bows To Parzate® Too

The tobacco grower whose plant bed has been wiped out by blue mold usually resolves to protect his plants next year.

This coming season he will have a new and remarkably effective fungicide for that purpose—Du Pont "Parzate." Like its sister product, Du Pont "Fermate" fungicide, "Parzate" is exceptional in blue mold prevention.

"PARZATE" FUNGICIDE also gives remarkable control of the major diseases of tomatoes and potatoes: early blight, late blight and leaf spots. The complete absence of burning or other caustic action on the foliage, along with practically perfect disease control, makes "Parzate" a natural for these crops. It is also excellent for diseases of onions, celery, cucurbits, cabbage, beans, spinach and the like.

DU PONT "PARZATE" is only one of many outstanding Du Pont chemicals for the farm. You can get full information on it from your local Du Pont technical representative. Or write to Du Pont, Grasselli Chemicals Dept., Wilmington 98, Delaware.

Tune in Du Pont "CAVALCADE OF AMERICA"—Tuesday Nights, NBC Network

---

DU PONT

REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
... THROUGH CHEMISTRY

Du Pont Chemicals for the Farm Include: *Fungicides:* PARZATE® (Liquid and Dry), FERMATE®, ZERLATE®, Copper-A (Fixed Copper), SULFORON® and SULFORON®-X Wettable Sulfurs—*Insecticides:* DEENATE® DDT, MARLATE® (Methoxychlor), LEXONE® (Benzene Hexachloride), KRENITE® Dinitro Spray—*Weed Killers:* AMMATE®, 2,4-D, TCA and Dinitro Weed Killers—*Also:* Du Pont Cotton Dusts, Du Pont Spreader Sticker, PARMONE® Fruit Drop Inhibitor and many others.

®REG. U. S. PAT. OFF.

[On all chemicals always follow directions for application. Where warning or caution statements on use of the product are given, read them carefully.]

Reduced Storage and Shipping Costs...

...part of the 2¢ per pound you save by using CELITE* in your primary grinds

ECONOMIES ALL ALONG THE LINE... savings that may amount to as much as 2¢ per pound on every pound of toxicant you grind . . . that's what the high absorption properties of Celite 400 can mean to you in cutting your production costs.

Here are three typical ways in which Celite 400 will help you save:

Reduced grinding costs: Because of Celite's higher liquid absorption properties (more than twice its weight of water), you can grind up to 70% DDT mixtures. High concentrates of BHC and other low melting point poisons may also be ground with Celite.

Reduced packaging costs: The higher strength primary grinds made possible by the use of Celite 400 enables the packaging of more toxicant per unit package.

Reduced storage and shipping costs: These highly concentrated primary grinds produced by the use of Celite 400 ship and store more economically.

In addition to these savings, Celite 400, when used as the primary grinding aid, will impart greater kill power to the poison. Also, when used as the absorbing agent for liquid poisons, Celite 400 makes highly concentrated dry dusts at the lowest possible cost. For more information on the use of Celite 400, write Johns-Manville, Box 290, New York 16, N. Y.

TYPICAL CELITE 400 PROPERTIES

Fineness: 8% maximum on 325 mesh
Density (Vibrated): 12.5 pounds per cubic foot
Bulk: Celite bulks much higher than most diluents
Absorption: 215% of its weight of water
300% of its weight of kerosene
pH Value: Below 7.0
Inertness: Compatible with insecticide and fungicide poisons
Suspension: Excellent in both air and water
Composition: Celite is amorphous diatomaceous silica (SiO_2)

*Reg. U. S. Pat. Off.

Johns-Manville CELITE 400

BEMIS paper bags for chemicals

As one of America's largest producers of multiwalls and other paper bags, Bemis naturally makes many types to serve varied packaging requirements.

For the chemical industry, several types of construction are produced. The paper bags most generally used are shown here.

Note the variety of the Bemis line when you are buying paper bags for chemicals. It gives you wider choice in quality bags from a single source.

Bemis

Peoria, Ill. • East Pepperell, Mass. • Mobile, Ala. • Houston, Texas
San Francisco, Calif. • Vancouver, Wash. • Wilmington, Calif.

Baltimore • Boise • Boston • Brooklyn • Buffalo • Charlotte • Chicago • Cleveland • Denver
Detroit • Indianapolis • Jacksonville, Fla. • Kansas City • Los Angeles • Louisville • Memphis
Minneapolis • New Orleans • New York City • Norfolk • Oklahoma City • Omaha • Phoenix
Pittsburgh • St. Louis • Salina • Salt Lake City • Seattle • Wichita

★ *Profit-Protected with*

SWAN BRAND FUMIGANTS

Made in five different formulations to assure dependable results under all conditions, Swan Brand Fumigants provide positive control over grain weevils, rice weevils, lesser grain borers, confused flour beetles, angoumois grain moth larvae, Indiana tooth larvae, cadelle, black carpet beetles, saw tooth grain beetles and similar pests.

FUMIGAS—Dependable all-purpose grain fumigant for large or small storage bins, elevators, warehouses and box cars.

SPOT FUMIGANT—(15% Ethylene Dibromide by volume) For local control in boots, reels, conveyors, spouts or infested bags and products to supplement general plant and grain fumigation.

FUMIGANT NO. 2—(Ethylene Dibromide 5% by volume) Complete penetration controls grain pests at top, center and bottom of bins.

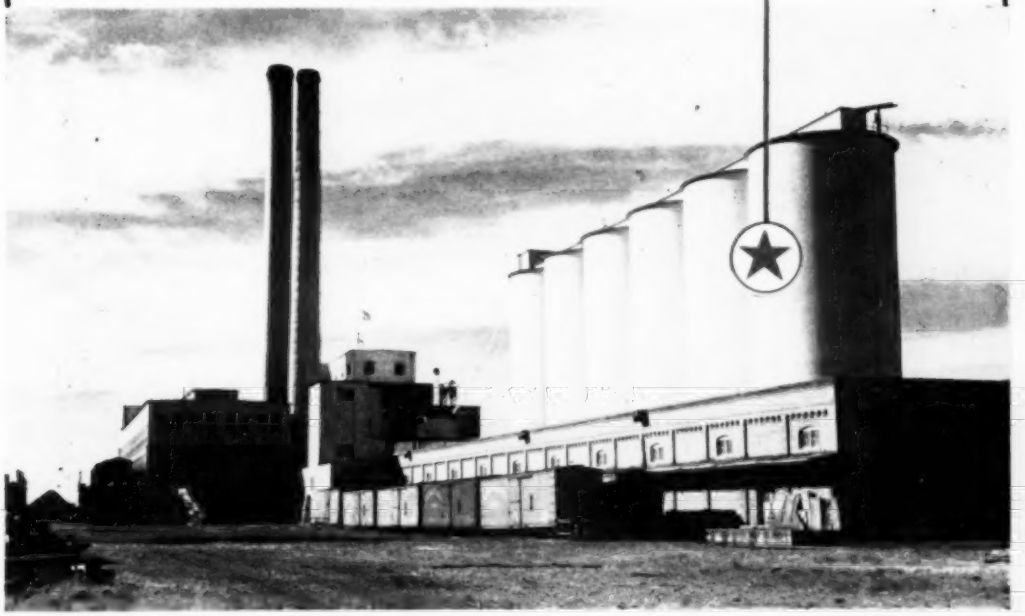
CONTACT SPRAYS—For storage containers prior to use. Use Swan Brand Contact Spray (non-toxic) or Ded-Tox Residual Spray (DDT base) at rate of 1 gal. per 1000 sq. ft.

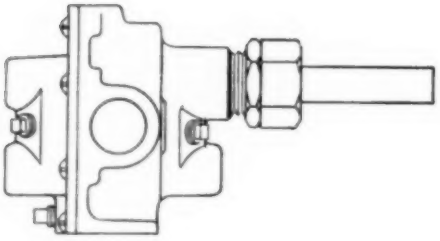
PERMITTED AND APPROVED BY MILL MUTUAL FIRE PREVENTION BUREAU

THOMPSON-HAYWARD CHEMICAL CO.

KANSAS CITY, MISSOURI

MINNEAPOLIS	OKLAHOMA CITY	N. LITTLE ROCK	SAN ANTONIO		CORPUS CHRISTI
DES MOINES	DAVENPORT	NEW ORLEANS	ST. LOUIS	HOUSTON	DALLAS
WICHITA	MEMPHIS	CHICAGO	OMAHA	DENVER	TULSA





More weed-spraying outfits are equipped with Oberdorfer Bronze Pumps than with all other makes of pumps combined.

Why? Because Oberdorfer Pumps perform better, last longer and cost less.

AGRICULTURAL PUMP DIV. OBERDORFER FOUNDRIES, INC. SYRACUSE, N. Y.

ANTS...ROACHES...GRASSHOPPERS...LICE...MANGE MITES...FLEAS...FLIES...EARWIGS

JAP BEETLE LARVAE...APPLE MAGGOTS...FLOUR BEETLES...WIREWORMS...WHITE GRUBS...CUTWORMS...BOLL WEEVILS...THRIPS

CHIGGERS...CARPET BEETLES...PLUM CURCULIO...MOLE CRICKETS...SOD WEBWORMS...SOWBUGS...STRAWBERRY WEEVIL...SILVERFISH

OCTA-KLOR

Octa-Klor* brand

Chlordane

Agricultural • Refined

Basic toxicant for more effective control of Agricultural, Household and Industrial Insect pests, and Animal Ectoparasites.

Concentrates and ready-to-use insecticide formulations containing Octa-Klor Brand CHLORDANE are available from leading suppliers.

Write for information and technical data.

Guaranteed kill of 150% of alpha isomer of Chlordane — Bioassay Methods. OCTA-KLOR brand Chlordane assures highest quality formulations. Write for details.

Julius **HYMAN** *& Co.*
DENVER, COLORADO

EASTERN SALES OFFICE
11 WEST 42ND STREET
NEW YORK 18, NEW YORK

WEST COAST OFFICE
25 BEALE STREET
SAN FRANCISCO 5, CALIF.

LEAF MINERS...ONION MAGGOTS...SQUASH BUGS...CARROT RUST FLIES...MOSQUITOES

RICELAND RICE HULLS

are the perfect conditioner for

Chemical Fertilizers

- ✔ Scientifically dried and ground especially for fertilizer conditioning.
- ✔ Available in fine ground No. 16, medium ground No. 14 and coarse ground No. 12.
- ✔ Used and preferred by leading fertilizer manufacturers.
- ✔ Available in large volume the year 'round.
- ✔ Shipped in bulk or 100-pound burlap bags (25 to 40 tons per car).
- ✔ Very inexpensive.
- ✔ Wire, phone or write for free sample and price.

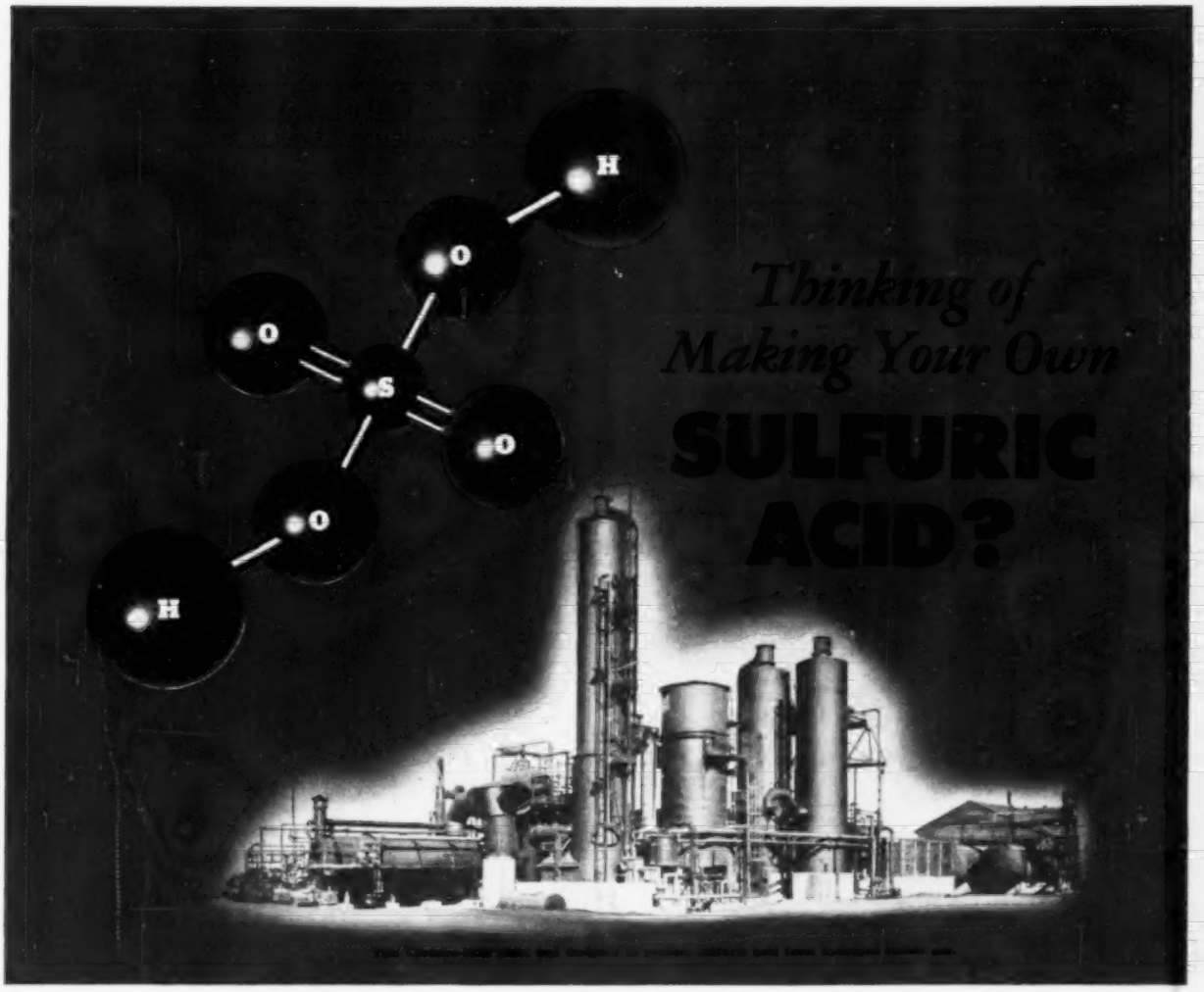
RICELAND RICE HULL DIVISION

ARKANSAS RICE GROWERS CO-OP ASS'N.

STUTTGART, ARK. • PHONE L. D. 10

World's largest rice growing, milling, storage and marketing organization.

World's largest year 'round supplier of rice hulls to fertilizer manufacturers.



Many users find it economical to buy sulfuric acid in drums or in tank cars. Others—who need larger quantities—produce their own more profitably. If you have been contemplating the expansion of your present facilities or the erection of a new plant for the manufacture of sulfuric acid, consider these facts about Chemico-built contact acid plants.

TROUBLE FREE OPERATION—You get maximum production of acid the year round because of Chemico's *exclusive* Spray Type Sulfur Burning Equipment.

ECONOMICAL HEAT RECOVERY—Heat resulting from the combustion of sulfur and from the conversion of SO_2 to SO_3 is recovered in waste heat boilers and economizers as valuable by-product steam. This makes possible greater economy of operation, elimination of the need for a separate supply of steam and cools the gases to suitable operating temperatures.

HIGH CONVERSION—The high production rate and low operating costs of Chemico plants are largely due to the well-designed converters and the use of the highly effective, non-poisonable Vanadium Catalyst.

These cost-reducing design features are only a few of the outstanding benefits of Chemico-built sulfuric acid plants. They may point the way to vital savings in fulfilling your acid needs. But before deciding whether it would be sound business to produce your own sulfuric acid, discuss your specific problems with Chemico.

AN INTERESTING BULLETIN S-101—gives you additional information on Chemico Sulfuric Acid Plants. Write for your copy today.

CHEMICAL CONSTRUCTION CORPORATION

EMPIRE STATE BLDG., 350 FIFTH AVENUE, NEW YORK 1, N. Y.

EUROPEAN TECHNICAL REPRESENTATIVE

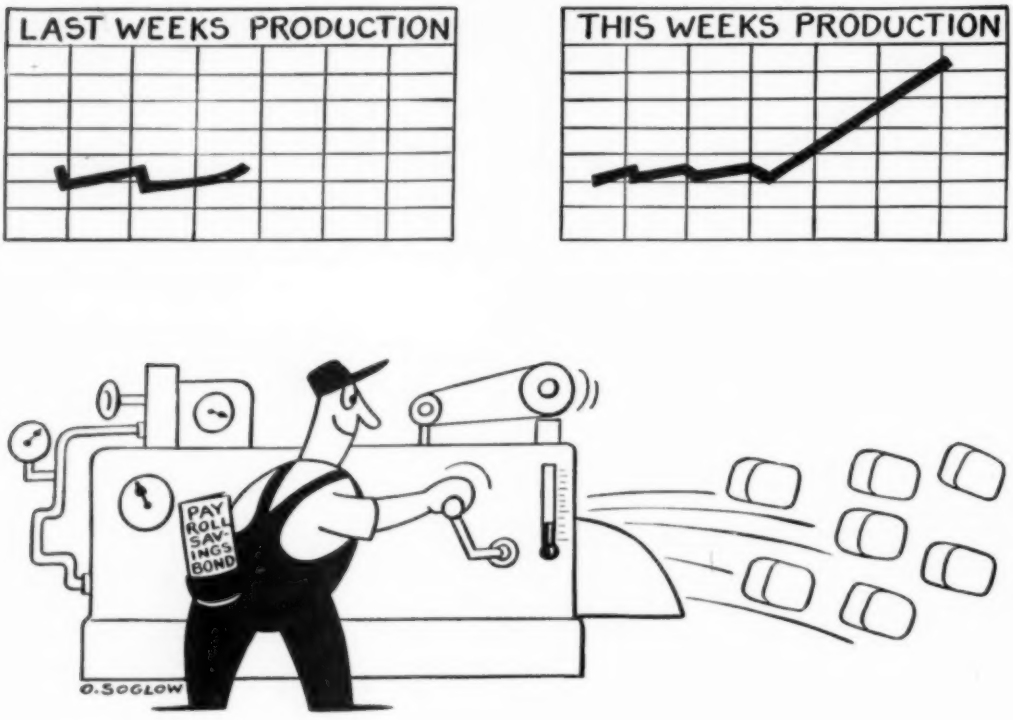
CYANAMID PRODUCTS, LTD., BRETTENHAM HOUSE, LANCASTER PLACE, LONDON W. C. 2, ENGLAND

CABLES: CHEMICONST, NEW YORK

CHEMICO

Chemico Plants are Profitable Investments

CC-101



Boost your employee-participation in the Payroll Savings Plan and you boost your production!

You are skeptical? Then consider this logic: The more U. S. Savings Bonds an employee holds, the more secure he feels. The more secure he feels, the greater his peace of mind the more contented he is with his job. Results? Less absenteeism, less labor turnover, fewer accidents. *End result: increased production.*

And you needn't depend on theory alone. For those company benefits of the Payroll Savings Plan are borne out in the experience of more than 20,000 companies promoting the Plan.

LONG-RANGE BENEFITS, TOO

Bond sales spread the national debt, thus increasing our national economic security. And, of course, what's good for that is also good for you and your business.

The individual Bond Buyer gets back $4, when his Bonds mature, for every $3 he invested. That's a boon for him, and multiplied by millions of Bond holders represents a huge backlog of purchasing power that will help assure national prosperity through the years ahead.

IT'S EASY TO BOOST PARTICIPATION

1. See that a top management man sponsors the Plan.
2. Secure the help of the employee organizations in promoting it.
3. Adequately use posters and leaflets and run stories and editorials in company publications to inform employees of the Plan's benefits to them.
4. Make a person-to-person canvass, once a year, to sign up participants.

These first four steps should win you 10-60% participation. Normal employee turnover necessitates one more step:

5. Urge each new employee, at the time he is hired, to sign up.

Nation-wide experience indicates that 50% of your employees can be persuaded to join—without high-pressure selling. All the help you need is available from your State Director, U. S. Treasury Department, Savings Bond Division. He is listed in your phone book.

The Treasury Department acknowledges with appreciation the publication of this message by

AGRICULTURAL CHEMICALS

This is an official U. S. Treasury advertisement prepared under the auspices of the Treasury Department and the Advertising Council.

"Drop dead, rat"

ANTU* has your number!

* Alpha Naphthylthiourea

Pittsburgh
Agricultural Chemicals

2, 4-D Acid
2, 4-D Amine Concentrates
2, 4-D Sodium Salt Monohydrate
2, 4-D Ester Formulated Concentrates
2, 4, 5-T Ester Formulated Concentrates
Phenolate-O
Phenolate-S
DNOC—Technical
Parathion—Technical
15% Parathion Wettable Dust Concentrate
25% Parathion Dust Concentrate
Alpha Naphthylthiourea (ANTU)
Iminol—A
Iminol—D
Quaternary Ammonium Compounds

The cunning, disease spreading, property ravaging rat has plagued the world for centuries and defied destruction by mankind until now!

Now, what traps and guns have failed to accomplish, the chemists' newest poison may achieve. For alpha naphthylthiourea, popularly known as ANTU, is proving to be the most deadly baiting and tracking poison yet developed . . . but for all its effectiveness on rats it is less dangerous to animals and humans than previous chemical rat killers.

ANTU is one of the basic products of the *Pittsburgh* agricultural chemical line, which includes rodenticides, fungicides, insecticides and germicides, all standardized chemically and biologically and available in either technical grade ANTU or 20% dust concentrate.

Requests for further information and quotation are invited.

PITTSBURGH AGRICULTURAL CHEMICAL CO.
6505-A Empire State Building • 350 Fifth Avenue • New York 1, N. Y.

Affiliated with
PITTSBURGH COKE & CHEMICAL COMPANY
Grant Building • Pittsburgh 19, Pa.

the ROOT of crop loss can be WIREWORM!

control it and other soil infesting insects with

CHLORDANE

"VELSICOL"

Wireworm: "VELSICOL 1068" chlordane has proven to be an outstanding toxicant for control of wireworms. It may be applied as a dust, spray, or incorporated with fertilizers.

Chlordane offers protection to many crops including corn, potatoes, sugarcane and tobacco.

Effective in action. Bigger crops, larger yields due to increased plant growth.

Other soil-infesting insects controlled by "VELSICOL 1068" chlordane are: Japanese Beetle Larvae, Cutworms, White Grubs, White Fringe Beetle Larvae, and Southern Corn Rootworm Larvae.

Write for complete technical information.

VELSICOL CORPORATION

330 EAST GRAND AVE., CHICAGO, ILL. • REPRESENTATIVES IN PRINCIPAL CITIES

GRAIN grows Fast in Minnesota

Farmers tell us it always helps

to use quality fertilizers containing . . .

INTERNATIONAL POTASH

Even in that wonderful country of the northwest, grain doesn't grow quite as fast as the imaginative artist indicated, even when *International Potash* is used in the fertilizer mixture.

But thousands of farmers have learned by profitable experience that the generous use of carefully selected plant foods assures them healthier growth of grain crops, large yields and fine quality. With an extra benefit—the stored up fertility in the soil that will pay off in the future.

Because quality plant foods are so essential in the productivity of mixed fertilizers for grain and fruit and vegetables and for cotton and tobacco, many fertilizer manufacturers are using *International Potash* regularly.

There's another advantage for you in using *International Potash*—its *workability*, the free-flowing characteristics of its clean, dry crystals. *International Potash* is mined and refined at Carlsbad, New Mexico, and shipped in excellent mechanical condition to help you produce quality fertilizers.

SUL-PO-MAG (Water-Soluble Double Sulfate of Potash-Magnesia)

MURIATE OF POTASH • SULFATE OF POTASH

Sul-Po-Mag Trademark Reg. U. S. Pat. Off.

POTASH DIVISION • INTERNATIONAL MINERALS & CHEMICAL International Minerals & Chemical **CORPORATION**

GENERAL OFFICES: 20 NORTH WACKER DRIVE, CHICAGO 6

Know the Facts

DIRECTORS

W. W. ALLEN
Manager, Agricultural Chemical Sales, The Dow Chemical Company, Midland, Mich.

W. C. BENNETT
President, Phelps Dodge Refining Corporation, New York.

J. HALLAM BOYD
Exec. Vice-President, Commercial Chemical Company, Memphis, Tenn.

ERNEST HART
President, Niagara Chemical Division, Food Machinery & Chemical Corporation, Middleport, N. Y.

LEA S. HITCHNER
Executive Secretary, NAC Association, Washington, D. C.

JOHN PAUL JONES
Assistant to General Manager, Stauffer Chemical Company, New York.

GEORGE F. LEONARD
Exec. Vice-President and Treas., Tobacco By-Products & Chemical Corporation, Inc., Richmond, Va.

PAUL MAYFIELD
Assistant General Manager, Hercules Powder Company, Inc., Wilmington, Del.

A. W. MOHR
President, California Spray-Chemical Corporation, Richmond, California.

JAMES McCONNON
Vice-President, McCommon & Company, Winona, Minn.

E. H. PHILLIPS
Director of Purchasing, GLF Soil-Building Service, a Division of Co-operative GLF Exchange, Inc., N. Y.

FRED SHANAMAN
President, Pennsylvania Salt Manufacturing Company, of Washington, Tacoma, Wash.

RUSSELL B. STODDARD
Coordinator of Insecticide Operations, U. S. Industrial Chemicals, Inc., New York.

T. S. WASHBURN
Director, Agricultural Chemicals Division, American Cyanamid Co., New York.

BYRON P. WEBSTER
Vice-President, Chipman Chemical Company, Inc., Bound Brook, N. J.

KNOWING the facts about how proposed government and legislative actions can affect your business is a part of our function. Whether you are a manufacturer or a formulator, you will find the many regular and special services of NAC helpful in charting the course of your business.

Members of NAC receive regular Bulletin Services reporting the latest developments and background of both National and State activities.

This is but one phase of NAC services which include:

Special FDA Hearing Bulletins

Technical

Legislative

Legal

Information

Membership in NAC will help you KNOW THE FACTS.

★ ★ ★

National Agricultural Chemicals Association

. . . Formerly the AIF Association

Barr Bldg., 910 17th St., N.W. Washington 6, D. C.

OFFICERS

ERNEST HART, *President*

A. W. MOHR, *Vice-President*

LEA S. HITCHNER, *Executive Secretary and Treasurer*

A NEW inexpensive

SEQUESTERING AGENT for 2,4-D in HARD WATER

PFIZER Citric Acid

• Recent laboratory experiments have shown that the inclusion of 2% Citric Acid in concentrates containing 40% 2,4-D (free acid basis) amine salts will prevent precipitation by the metallic ions in hard water*. Since Citric Acid forms complexes with these ions efficiently, all of the 2,4-D is fully available for its herbicidal action.

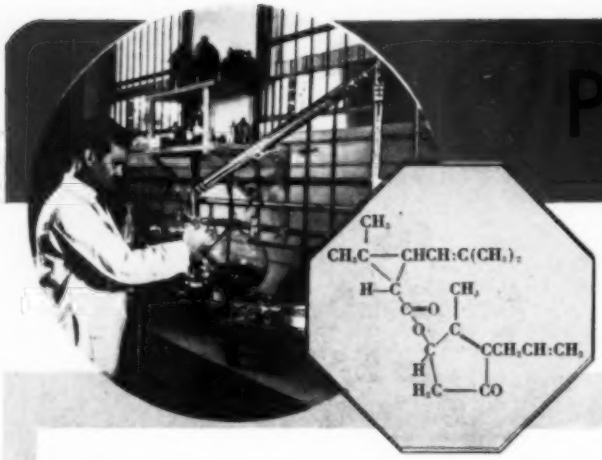
Tests performed in our laboratories, showed Citric Acid to be a *more efficient* sequestering agent in many cases than other commonly used products, *and as favorable* in all cases.

Important savings and increased efficiency await the users of Citric Acid as a sequestering agent. It is available as Anhydrous Citric Acid, or as the U.S.P. product, the former product being the most economical buy. For samples of Citric Acid or detailed information on its use as a solubilizing agent for 2,4-D amine salts write today to: Chas. Pfizer & Co., Inc., 630 Flushing Avenue, Brooklyn 6, N. Y.

Based upon water of 1000 PPM hardness. For harder water the concentration must be proportionally increased.

PFIZER

Manufacturing Chemists Since 1849



PYRESYN

(Synthetic "pyrethrum")

—more precisely: allyl homolog of Cinerin I

Last month we announced that manufacture of Pyresyn is scheduled so deliveries can start January 1st for the 1950 season.

When the synthesis was publicized by the government eight months ago, it did not seem possible that the synthetic product could be produced commercially for next year's use. Credit is due government and industry for the intensified effort which resulted in this achievement in so short a space of time.

While further entomological and toxicity studies are in progress, our confidence in the fundamental data on the allyl homolog of Cinerin I is such that manufacture is actually in progress on a substantial scale. Collaterally, there is extensive testing on a wider variety of insects to be accomplished and published: this work continues.

Look for further announcements month by month in this space.

S. B. PENICK & COMPANY

50 CHURCH STREET, NEW YORK 7, N. Y.
Telephone, COrtlandt 7-1970

735 WEST DIVISION STREET, CHICAGO 10, ILL.
Telephone, MOHawk 5651

THE EDITOR COMMENTS

IT was with regret and considerable surprise that the agricultural chemical trade received the announcement from L. W. Kephart that he would retire from the Department of Agriculture after a distinguished service of 36 years. Those connected with the sectional weed control conferences will especially miss his friendly counsel as he takes on new responsibilities which will require his being outside the U. S. most of the time.

To say that Mr. Kephart took his work seriously, is merely stating the obvious. His record with the Department, as director of weed investigations, is one characterized by devotion beyond duty, as a military citation might read. Members of the staff of *Agricultural Chemicals* had an opportunity to know Mr. Kephart quite intimately, since he has been for several years a member of our editorial advisory board. We know how industriously he worked and how hard he tried to cope with many problems of weed control which came to him, personally, for solution . . . particularly when 2,4-D was introduced to the public.

It seems a shame that the Government Service is unable to hold men of the ability and reputation which Mr. Kephart has attained. We, like many others throughout the country, are sorry to see him leave; but at the same time we wish him well in his new position with the World Bank.

SIGNIFICANT to us is a statement in a recent report coming out of Rutgers University which said in part: ". . . small farms in the Northeast can use profitably much more fertilizer than has been considered expedient. Dean Martin said that while 500 pounds of fertilizer an acre was considered sufficient by most farmers, 1,100 pounds were now being used at Fiddler's Creek and it was expected that this would eventually reach 2,000 pounds an acre."

Remarkably increased productivity through wider chemical enrichment of the soil, plus improved mechanical aids, on a small New Jersey farm owned by a well-known banker and economist was the subject of the experiment which brought forth the report. With the cooperation of several large industrial concerns and Dean William Martin and a half-dozen professors at the Rutgers agricultural school, improvements in seeding, harvesting, weed control and soil enrichment showed what can be done in the underdeveloped agricultural resources of the northeast section of the country. Particularly as he regards grasslands farming for dairy herds, the heavy dosages of chemical fertilizers evidentaly paid off in the farm profit column.

Increased use of fertilizer per acre beyond what heretofore may have been considered the maximum for good agricultural economy, naturally has a deep interest for every fertilizer manufacturer. The future expansion of the industry is involved closely with such developments. Hence, the keen interest in the reported findings of this experimental project out New Jersey way.

ONCE more we pause briefly to utter a few commendatory words in behalf of the Interdepartmental Committee on Pest Control, which with the subcommittee on nomenclature of the American Phytopathological Society, has come up with five new common names for fungicidal materials. This is quite a step in the direction that everyone in the industry seems to want to go . . . namely, toward uniformity in terminology to help untangle the confusion which inevitably arises when a given product may be called by a half-dozen different names.

The newly-coined terms are not likely to be confused with any other names in the field. Hereafter, when plant pathologists and others speak

of "ferbam," "ziram," "nabam," "zineb," and "thiram," they are speaking of fungicidal materials which have been accepted by responsible groups and filed with the Trade Mark Division of the U. S. Patent Office to preempt use of the names as trade marks.

The distance is becoming shorter between where we now stand and where we want eventually to arrive in the matter of nomenclature for pesticides. New hope is stirred in the agricultural chemical industry whenever an announcement like this is made, and we certainly look forward to hearing that more chemical compounds have been given coined names by which they will be known from now on.

Selection of an acceptable name for any fungicidal compound is a tough job, mainly because it has to have the blessing not only of the APS, but must also pass the scrutiny of such groups as Governmental agencies, the Committee on Therapeutic Agents and Appliances of the American Veterinary Medical Association; American Medical Association; Association of Economic Poisons Control Officials; American Chemical Society; and the U. S. Department of Agriculture's Insecticide Division of the Production and Marketing Administration and the Bureau of Plant Industry, Soils, and Agricultural Engineering.

Anyone who thinks it is a simple matter to jump all of these hurdles without barking his shins, ought to try it!

SARTLING increases in the money value of agricultural insecticides, fungicides and weed killers shipped in the U. S. in 1947 are noted in the *Census of Manufactures, 1947*, recently issued by the Bureau of the Census of the Department of Commerce. According to the totals arrived at by government statisticians, the value of products shipped in 1947 was $85,824,000. No comparable total figures for 1939 are available, but usually when individual items are compared, the totals for 1947 completely overshadow those of the prewar year.

Since these computations are based on the value of goods f.o.b. plant, the figures should be practically doubled to arrive at the actual retail value. By percentages, as well as by the cold figures themselves, the progress in only eight years is almost fantastic.

Added to this is the fact that the census totals obviously under-estimate the size of the actual market. Industry studies reveal that many plants manufacturing insecticides, fungicides, weed killers, etc., are not on the government's lists and therefore the total is short by that much. The number of new firms in the field has been growing so fast that it is not at all surprising if the census workers have been unable to keep pace with such rapid expansion.

It is interesting to speculate beyond 1947, the last year for which figures are available, and try to visualize what the figures for 1948 and 1949 might be if it were possible to compute them right now. Certainly they would be far above the totals of 1947 bpth in quantity and in value, but just how much would be anybody's guess. Suffice it to say, however, that the agricultural use of insecticides and fungicides is more than here to stay . . . it is on the increase, year after year.

And with the increased volume comes a deeper feeling of responsibility on the part of everyone having to do with these toxicants. The irresponsible minority is being pushed out, leaving the trade more and more in the hands of reliable operators who will continue to build soundly.

Statistics show only a portion of the whole picture, we know. But when even incomplete figures reveal an increase of the proportions revealed by this latest census, it makes the world sit up and take notice!

INITIAL steps have been taken toward organizing the "Canadian Prairie Agricultural Chemicals Association," and it appears that this group, composed of basic manufacturers, processors, jobbers and distributors of agricultural chemical products may soon come into being. The Canadian counterpart to the N.A.C.A. in the United States, will have the blessing of American industry, because the need for such an organization in the Dominion has been evident for a long time. Possibly by next month, we may be able to report the actual founding of CPACA, which will be a pleasure!

Guest Editorial written especially for this issue of Agricultural Chemicals

Industry Looks at FDA Tolerance Hearings

By

Ernest Hart
President, National Agricultural Chemicals Association

THE Food and Drug Administration will receive the cooperation of the agricultural insecticide industry as public hearings are held, beginning next January 17, on the problem of establishing official tolerances which by regulation will govern the amount of poisonous or deleterious residues permitted on fresh fruits and vegetables at the time of marketing.

The determination of legal tolerances for agricultural chemicals poses a complex but not insoluble problem. It is a problem which requires the able and conscientious cooperation of all interested groups and agencies in order to develop a solution which is fair to industry, to agriculture and to the public generally.

Various elements of the problem have already been the subject of intensive research by chemists, entomologists, plant pathologists, toxicologists and other scientists of various governmental agencies and of many insecticide manufacturers. Substantial progress has already been made and any additional information needed to establish tolerances will be developed in the laboratories of these scientists.

Many segments of our economy will have a prime interest in the results of the tolerance hearings. In the front rank, of course, are the growers of fruits and vegetables who apply agricultural chemicals. Their use of these materials will be influenced by the tolerances set for them. The problem of tolerances is also of keen interest to several agencies of government, to canners and other groups of the food industry, to the medical profession, and to the agricultural chemical industry.

Representatives of these and perhaps other groups, it may be assumed, will be heard in the course of the Food and Drug Administration hearings.

Such representation is clearly in the public interest and should result in the presentation of all relevant information possible to obtain. And as full information is presented, the task of

(*Continued on Page 71*)

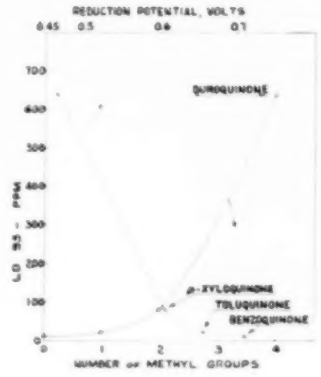
USE OF QUINONES AS FUNGICIDES[1]

SINCE about ten years ago tetrachloro-p-benzoquinone[2] is an excellent seed protectant, research on quinone fungicides has been intensified. In the Naugatuck Chemical organization, for instance, several hundred quinones and quinoid compounds have been examined, many of which are active fungicides. The present report reviews the published investigations of quinone fungicides.

Tetrachloro - p - benzoquinone has found widespread application as a seed protectant to prevent seed decay and damping-off.

2, 3-dichloro-1, 4-naphthoquinone,** which has been developed as an agricultural fungicide, is exceptionally active among the organic fungicides both as a seed protectant and as a foliage spray.

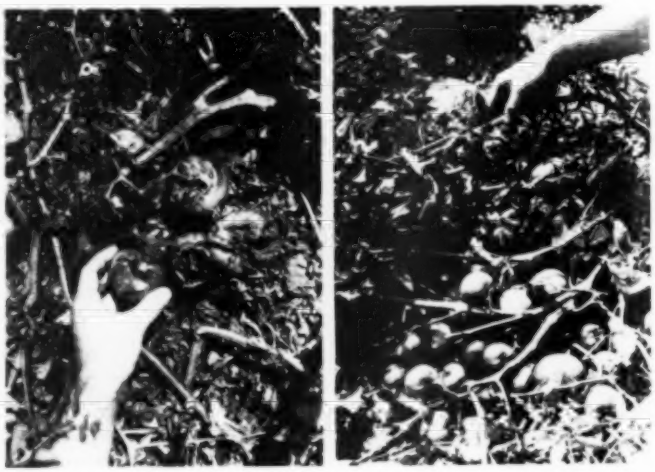
Figure 1



Although quinones have been known for over a century, they are comparative newcomers to the field of agriculture. About ten years ago, research was started in the Naugatuck laboratories which led to the discovery of the valuable fungicidal powers of tetrachloro-p-benzoquinone or chloranil. This announcement was made in a publication by Cunningham and Sharvelle in 1940 (5). Four years later, patents were issued to terHorst covering both tetrachloro-p-benzoquinone (50) and 2, 3-dichloro-1, 4-naphthoquinone (52) as fungicides, and both of these have since become commercial products.

Like DDT, chloranil is an old compound. It was prepared by Erdman in 1843 (11) by the chlorination of aniline, hence its name, but it remained little more than a laboratory reagent until its fungicidal value was discovered. A fair volume of chloranil was used in Germany during the war as a dyestuff intermediate (55) but in the United States its principal use has been as a seed protectant. Perhaps even more important, as Horsfall (21) has said, it "opened a new era in plant pathology. It made organic fungicides fashionable."

While these two quinones are the outstanding examples of the



Tests with "Phygon" against tomato blight (phtophthora infestans). The crop at the left received no treatment of any kind. The tomatoes in photo at right, in same field, were sprayed with "Phygon." (Photos courtesy Naugatuck Chemical Div., U. S. Rubber Co.

1 Presented as part of symposium on Chemicals for Agriculture, 111th ACS meeting, Washington, D. C.

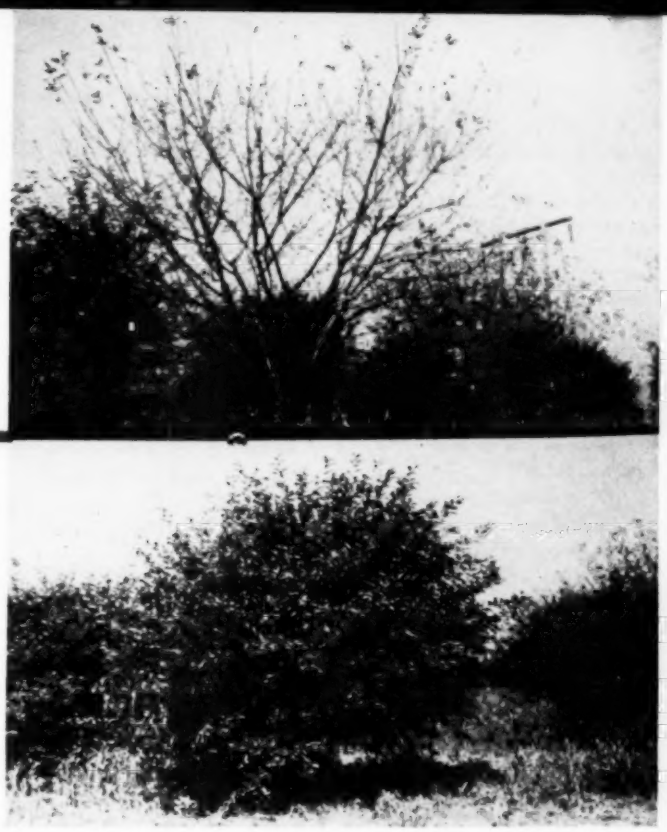
2 Marketed as "Spergon," by Naugatuck Chem. Div., U. S. Rubber Co.

** Marketed as "Phygon" and "Phygon XL" by Naugatuck Chem. Div., U. S. Rubber Co.

by

**D. L. Schoene,
H. Douglas Tate
& T. W. Brasfield**

Naugatuck Chemical Division
U. S. Rubber Company



Tests for control of cherry leaf spot (coccomyces hiemalis) with "Phygon." Tree at top was untreated. Lower photo shows tree which was treated with the fungicide. (Photo courtesy Naugatuck Chemical Division.)

group, many other quinones have fungicidal properties. These have been the subject of extensive investigations in a number of laboratories, and this report discusses the properties of quinone fungicides which are important in agriculture. Presented also are new data showing how fungicidal properties vary with chemical structure.

The promising results obtained with chloranil stimulated other work and the following quinones have since been reported as fungicides: quinone dioxime (52); juglone (20); 2-chloro-1, 4-naphthoquinhydrone (24); 2-3, dichloro-1, 4-naphthoquinone (53); 2-methyl-1, 4-naphthoquinone, and 1, 4-benzoquinone (16); 2-methyl-3-chloro- and 2-methyl-3-methoxy-naphthoquinones (4); 1, 4-naphthoquinone (13); the reaction products of tetrachloro-p-benzoquinone with the sodio derivatives of active methylene compounds (29); chloranil-oil mixtures (23); benzoquinonemonoxime semicarbazone (25); 2, 3-epoxy tetrahydronaphthalene-1, 4-dione (26); acenaphthene-1, 2-dione (27); 1, 4-naphthoquinone dichloride (28) and 2-methoxy-1, 4-naphthoquinone (33). A large number of publications describing tests with tetrachloro-p- benzoquinone and 2, 3-dichloro-1, 4-naphthoquinone have also appeared. These reports, written largely by experiment station workers, are too extensive for inclusion here but they will be summarized later in the sections devoted to the properties of these two fungicides.

A short chapter on quinone fungicides is included in a book by Horsfall (21) who states that 1, 2-naphthoquinone is more toxic than 1, 4-naphthoquinone. In general, however, it has been found that the 1, 4-quinones are more useful as agricultural fungicides.

Quinones from Natural Products

NUMEROUS quinones have been isolated from natural products, including plants, seeds, insects and fungi. These embrace most of the known quinone structures. Several of the simpler ones are known to be fungicides, but the greater number are non-fungicidal. None has found commercial application, and the group is mentioned here only to show that the quinone nucleus is of common occurrence in natural products.

Mechanism of Fungicidal Action

CONSIDERING the widespread occurance of quinones, it is a fair assumption that most fungi can tolerate or even utilize low concentrations of certain quinones. It seems reasonable then, that the fungicidal quinones might fit readily into certain phases of fungus metabolism but not be assimilated in subsequent phases, thus causing inhibition of growth or death. (No distinction is made in this report between fungicide and fungistat. For most agricultural uses, a material which will prevent a spore from germinating is as effective as one which will destroy it. Consequently, the more common term, fungicide, will be used to denote both).

Little has been published concerning the mechanism of fungicidal action and any theory must necessarily be based on very limited data. Colwell and McCall (4) have reported that certain compounds containing a thiol group, inhibit the antifungal action of 2-methyl-1, 4-naphthoquinone and 2-chloro-3-methyl-1, 4-naphthoquinone, but not 2-methoxy-

3-methyl-1, 4-naphthoquinone. They suggest that the toxicity of the first two involves blocking of fungus enzymes or metabolites containing thiol groups, but recognize that another mechanism must be responsible for the action of the 2-methoxy-3-methyl derivative. Quinones, depending upon their substituents, are reactive with a number of natural products including proteins, amino acids and enzymes. All of these reactions must be considered in any theory of fungicidal action.

The readily reversible reduction of quinones to hydroquinones suggests that such systems may be important in the mechanism of fungicidal action since living organisms have a sensitive oxidation-reduction balance. No published data have been found correlating reduction potentials of quinones with their action on fungi although Page and Robinson (46) have reported such a study with bacteria. Of the twenty quinones examined, those which had marked bacteriostatic action against *Staphylococcus aureus* had reduction potentials lying within the range of −100 to −150 millivolts, with the greatest activity coming at −130 millivolts. This relationship did not hold for *Escherichia coli*.

Unpublished data obtained by Ladd (39) demonstrate that the reduction potentials of 1, 4-benzoquinone and its methyl derivatives do correlate well with fungitoxicity as determined by slide tests using a *Metarhizium* species as the test organism. Both toxicity and reduction potential decrease progressively with increasing substitution. The relationship obtained in this simple series is far from general throughout the quinone family however, since 2, 3-dichloronaphthoquinone is much more toxic than p-benzoquinone and yet has a considerably lower reduction potential. Many other such examples can be found. It is a safe conclusion that some factor other than reduction potential alone is responsible for the toxicity of quinones. (*Fig.* 1, *Pg.* 24)

Comparison of Quinones

DURING the studies, several hundred different quinones or quinoid-like compounds have been tested as fungicides. Some of these have been crude reaction mixtures; the others well defined chemicals. As a group they contain a high percentage of effective chemicals and in 2, 3-dichloronaphthoquinone they include one of the most potent organic fungicides yet reported.

Chemically, quinones are very active, combining the reactions of a carbonyl group with the reactivity of an activated double bond. Although they have a cyclic, conjugated structure, quinones are non-aromatic and more nearly resemble in their reactions the aliphatic, alpha-beta unsaturated ketones. Their wide reactivity undoubtedly is important in their fungicidal activity, and the problem is not so much finding a quinone fungicide but one of modifying the quinone structure so as to retain the toxicity to fungi and at the same time make the chemical safe and stable enough for practical use in the field. It is beyond the scope of this paper to include a detailed discussion of the chemistry of quinones, but a convenient summary of quinone reactions may be found in a text by Fieser and Fieser (12).

Table I shows the structure of various quinones and their LD50 values obtained on slides using *Alternaria solani* as the test organism. The slide test used measured the germination of spores according to the procedure developed by McCallan and co-workers and later adopted by the committee on Standardization of Fungicidal Tests, American Phytopathological Society (40).

Phenanthrenequinone and acenaphthenequinone were quite effective on slides, but subsequent tests proved them to be less useful on seeds and foliage than several chlorinated quinones. Both benzoquinone and naphthoquinone combined adequate toxicity with high reactivity and they were selected for further study.

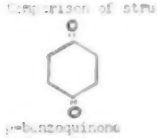
Table II shows the effect of chlorination on the fungitoxicity of p-benzoquinone. In addition to the slide tests, the compounds were also studied as foliage sprays using the technique of McCallan and Wellman (41), which measures the disease control effected by the chemical on artificially inoculated tomato plants. The organism used was *Alternaria solani* which is the causative agent in tomato and potato early blight.

Although improvement was noted in the slide results, the effect of chlorination was much more pronounced in the foliage tests. The poor result obtained with p-benzoquinone on foliage was possibly due to its high reactivity as evidenced by phytotoxicity, by its water solubility or by its volatility. Chloranilic acid, the hydrolysis product of tetrachloro-p-benzoquinone, maintained a fair LD95 value in spite of its water solubility.

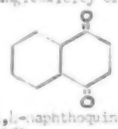
The improved toxicity of tetrachloro-p-benzoquinone was also evident in seed protectant studies and it has been in this application that the compound has found its greatest use. Concurrent with the increase in

TABLE I

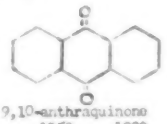
Comparison of structure and fungitoxicity of several quinones.



p-benzoquinone
LD50 30 ppm

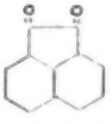


1,4-naphthoquinone
LD50 7



9,10-anthraquinone
LD50 1000

9,10-phenanthrenequinone
LD50 4



1,2-acenaphthenequinone
LD50 10

3,10-pyrenequinone
LD50 400

fungitoxicity was a decrease in toxicity to both man and plants.

Surprisingly, the low LD95 value of tetrachloro-p-benzoquinone on foliage was maintained in the field only in tests of short duration. This poor persistence may be due to several factors: Solubilization and loss through hydrolysis, photo-chemical decomposition or even sublimation. Leighton and Dresia (32) have reported that tetrachloro-p-benzoquinone is photochemically unstable in alcohol solution and our own work has shown that it decomposes at a measurable rate in solution even in the dark. On the other hand, the dry compound is stable indefinitely and its hydrolysis in water is extremely slow in the absence of alkali. Its protective action on seeds is known to persist over long periods and in this application its tenacity is excellent.

The data in Table III were obtained in a similar study of naphthoquinone derivatives. In this series, chlorination was even more beneficial, with the 2, 3-dichloronaphthoquinone being far superior to others in the series. Chlorination of a number of substituted naphthoquinones, not shown here, also improves toxicity, but none of these derivatives has approached the potency of 2,3-dichloro-1, 4-naphthoquinone. The LD95 value of 38 ppm as reported is a conservative figure, since values as low as 20 ppm have often been obtained.

Several of these compounds have been tested in the field both as foliage sprays and as seed protectants with results about as predicted from the LD95 values. For example, late blight of potatoes was controlled with 2, 3-dichloro-1, 4-naphthoquinone applied at a rate of one-half pound or less per acre, while phenanthrenequinone was required at a rate of four pounds per acre to give comparable control. The differences were even more pronounced in seed protectant studies where 2, 3-dichloro-1, 4-naphthoquinone was outstanding.

The toxicity of 2-methyl-1, 4-naphthoquinone was surprisingly low and the results are subject to question in view of Horsfall's statement (21) that it is more fungicidal than 1, 4-naphthoquinone itself. Some of our other tests have given 2-methyl-1, 4-naphthoquinone a higher rating, but results are not included here because direct comparisons were not made. At any rate, the comparable 2-chloro-3-methyl-1, 4-naphthoquinone is appreciably less effective than the 2, 3-dichloro derivative.

"Spergon"

SINCE its introduction as an agricultural fungicide in 1940, tetrachloro-p-benzoquinone has been more commonly known by its trade name,

(*Turn to Page 73*)

TABLE II

Effect of chlorination on the fungitoxicity of p-benzoquinone

Chemical	*Toxicity in ppm on slides LD50*	*Toxicity in ppm against Alternaria solani on tomato foliage LD95*
p-Benzoquinone	30	2000*
2, 5-Dichloro-p-benzoquinone	11	600
2, 6-Dichloro-p-benzoquinone	28	220*
Tetrachloro-p-benzoquinone	8	60
2, 5-Dichloro-3, 6-dihydroxy-p-benzoquinone (chloranilic acid)	18	180*

*Phytotoxic

TABLE III

Effect of substituents on the fungitoxicity of 1, 4-naphthoquinone

Chemical	*Toxicity in ppm on slides LD50*	*Toxicity in ppm against Alternaria solani on tomato foliage LD95*
1,4-Naphthoquinone	7	450*
2-Methyl-1, 4-naphthoquinone	18	2000*
2-Methoxy-1, 4-naphthoquinone**	13	300*
2-Chloro-1, 4-naphthoquinone	4	550*
2, 3-Dichloro-1, 4-naphthoquinone	0.9	38
2-Chloro-3-hydroxy-1, 4-quinone	25	2000*
9, 10-Phenanthrenequinone	4	450

*Phytotoxic

**Synthetic product. Little and associates (33) have confirmed these data using the natural product isolated from garden balsam.

TABLE IV

Increase in Yield of Lima Beans Grown from Seed Treated with "Spergon" (37)

Seed Treatment Used		Wt. of pods from seed sown*				
		May	May	June	June Avg.	Increase
Material	Rate Used Oz./bu.	20 lb.	30 lb.	4 lb.	11 lb.	in Yield %
"Spergon"	1.5	6.8	11.4	14.2	23.2	32.4
"Spergon"	3.0	7.0	12.1	14.1	22.9	33.3
Check	—	1.2	7.9	12.4	20.6	—

*Avg. yield from 100 seed sown in five tests on each date.

TABLE V

Emergence and yield of Surprise Peas Grown from Seed Treated with "Spergon" (38)

Seed Treatment Used	Rate Used Oz./bu.	Emergence, %	Yield of green peas per acre, lb.
"Spergon"	1.50	82.34	*
"Spergon"	0.75	81.35	3,721
None	None	66.12	2,889

*Yield records not obtained on this planting.

TABLE VI

Emergence and Yield of Sweet Corn Treated with Spergon and Sown Under Unfavorable Weather Conditions (36)

Seed Treatment Chemical Applied	Rate Used Oz./bu.	Average Emergence* %	Yield From 100 seed* lb.	Calculated Yield per acre, lb.	Increase From Treatment %
Spergon	2.0	75.0	62.0	10,591	19.0
Spergon	1.0	75.6	60.0	10,249	15.2
None	—	67.0	52.1	8,900	—

*Average of 5 test plots.

Methods to Attain

Truck Farm

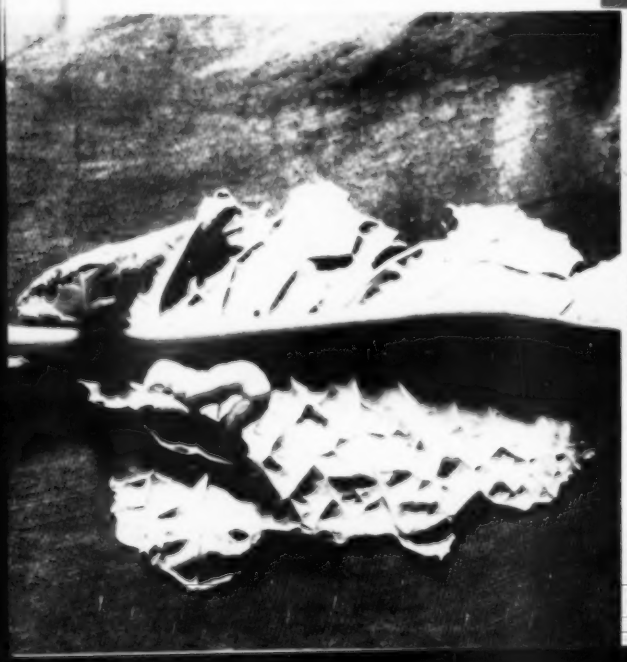
THE past growing season is one likely to be long remembered for insect infestations, and for efforts made to protect valuable crops through use of insecticides, both old and new. The application of insecticides from airplanes, helicopters, ground sprayers and dusters and hand-operated rigs all contributed to the over-all success. The results of these widespread efforts were seen in bumper crops.

Big truck farm operators, growing beans, broccoli, tomatoes and other crops on a large scale

Left: Healthy, adult Mexican bean beetles beginning to feed on a bean leaf. Although their work has just begun, evidences of damage may be seen already.

Below, left: Cabbage looper travelling along broccoli leaf in his characteristic fashion. This is one of the few times a looper has been photographed in action.

Below: Pupae infestation can be heavy. When Mexican bean beetle pupae reach this stage, it is usually too late to apply insecticides successfully. The pest should be controlled earlier, before damage is done.



Pest Control

naturally cannot gamble with cucumber beetles, Mexican bean beetles, cabbage loopers and other insect pests which can cause heavy losses in a single season. This year, as usual, precautions were taken by most growers, with splendid results.

Photos on these pages show the application of the relatively non-toxic insecticidal "CPR" Dust, and also shots of insect pests which damage truck farm crops. (All photos courtesy of U. S. Industrial Chemicals, Inc.)

Below: Covering 16 rows at a time, this duster takes care of a Pennsylvanian bean patch in short order. Use of insecticidal material of low toxicity enables dusting to be done close to harvest time.

Lower right: That the Mexican bean beetle is thorough in its work, is evident in this shot of lacework which remains when adults and larvae have finished. There were no beans harvested in this untreated plot.

Above, right: Airplane dusting truck crops with non-toxic insecticide. Note the curling tail of the discharge, depositing the dust on the underside of leaves in this broccoli seed bed.

Washington host to four groups of

Chemical Control Officials

FOUR associations of state control officials in the agricultural chemical field held their annual meetings at the Shoreham Hotel, Washington, D. C., October 8 to 12. The Association of American Feed Control Officials met on the fifth and sixth; the Association of American Fertilizer Control Officials held its third annual convention on the seventh; the Association of Economic Poisons Control Officials assembled in its third annual meeting on the eighth; and the Association of Official Agricultural Chemists occupied the final three days in its sixty-third annual meeting.

Each group elected officers, as follows:

Feed Control Officials

President, Bruce Poundstone, Lexington, Kentucky, to succeed A. M. G. Soule, Augusta, Maine.

Vice-president, Dr. M. P. Ethridge, State College, Mississippi, to succeed Mr. Poundstone.

Secretary-treasurer, L. E. Bopst, College Park, Md., who was re-elected.

Fertilizer Control Officials

President, J. B. Smith, Kingston, Rhode Island, succeeding B. D. Cloaninger, Clemson, S. C.

Vice-president, Rodney C. Berry, Richmond, Va., succeeding F. F. Quackenbush, Lafayette, Ind.

Secretary-treasurer, B. D. Cloaninger, formerly president, to succeed Henry R. Walls, College Park, Md.

Ec. Poisons Control Officials

President, J. F. Fudge, College Station, Texas, succeeding H. J. Hoffmann, St. Paul, Minnesota.

Vice-president, Allen B. Lemmon, Sacramento, Calif., succeeding Mr. Fudge.

Secretary-treasurer, A. B. Heagy, College Park, Md., who was re-elected.

All the past presidents of the Association of American Fertilizer Control Officials attended the meeting in Washington. Here they are with the newly-elected president, J. B. Smith (extreme right). The others, left to right are: D. S. Coltrane, former N. Carolina Agriculture Commissioner and now Assistant Director of the Budget, first president of AAFCO; Allen B. Lemmon, second president; and B. D. Cloaninger, third president and newly-elected secretary-treasurer.

AOAC Officers

President, W. A. Queen, Food and Drug Administration, Washington, D. C., succeeding L. S. Walker, Burlington, Vt.

Vice-president, H. A. Halvorson, State Dept. of Agriculture, St. Paul, Minn., succeeding Mr. Queen.

Secretary-treasurer, Henry A. Lepper, F.D.A., Washington, D. C., who was re-elected.

Numerous prepared papers were presented, talks were made by officials of trade associations, and the year's activities were covered in scores of reports of investigators during the eight-day period.

The first day's meeting of the feed officials included a report by the group's secretary, L. E. Bopst; the annual address by the president, A. M. G. Soule; and papers by Lloyd S. Rifford, president of the Beacon Milling Co.; W. M. Beeson, Purdue University, Lafayette, Ind.; John K. Westberg, The Borden Co., New York; and Lyman Peck, Chicago, Ill. The afternoon session consisted en-

—Photo Courtesy American Plant Food Council

tirely of reports by committee chairmen and investigators.

Speakers appearing on the second day's program included P. J. Schaible, Cincinnati, Ohio; T. H. Lukes, Lederle Laboratories, Pearl River, N. Y.; and J. T. Harvey, Food and Drug Adm., Washington.

Fertilizer Officials Meet

FOLLOWING the feed control group, the Association of American Fertilizer Control Officials assembled on October 7 for its single day session. In his presidential address, Dr. B. D. Cloaninger, Clemson, S. Carolina, head of the fertilizer group, reviewed the aims of the organization, reported the activities of the past year, and commented upon the "fine cooperation" between the two fertilizer trade associations.

Aims of the A.A.F.C.O., he said, are to promote uniform regulations and definitions throughout the U. S. He stated that a considerable amount of progress has been made along this line, and also reported that the development of new machinery and testing techniques has contributed to the general progress.

NFA Head Sees Progress

DR. Russell Coleman, president of the National Fertilizer Association urged the industry to do a vigorous job of selling the farmer on high analysis fertilizer materials. Freight rates make up 33 percent of the cost of fertilizer to the farmer, he pointed out, and these costs can be cut with higher analysis materials.

Photo Courtesy American Plant Food Council

Photo Courtesy National Fertilizer Association

Top photo: left to right, new officers of Economic Poisons Control Officials: Allen B. Lemmon, vice-president; Dr. J. F. Fudge, president; Dr. A. B. Heagy, secretary-treasurer.

Second photo: Clifton A. Woodrum, president, American Plant Food Council. L. S. Walker, immediate past president of AOAC; Wm. A. Queen, newly-elected AOAC president and H. A. Halvorson, St. Paul, Minn., newly-elected vice-president of AOAC. Photo taken at dinner given by APFC to honor members of Fertilizer Control Officials group.

Third photo: General scene at Mayflower Hotel as National Fertilizer Association entertained members of AOAC group at banquet, Oct. 10.

Below: Retiring president H. J. Hoffmann of Economic Poisons Control Officials greets his successor, Dr. J. F. Fudge following election.

The NFA head expressed approval at the improvement in relations between the industry and the control officials. In the past, he reminded, mutual suspicion existed which hampered the progress of each group. Now, with more understanding and cooperation, the two groups are working together to the benefit of the farmer. He said the industry regards the officials as a diplomatic corps rather than as "police," and that their good work is demonstrating the superior job to be done by state control officials.

Looking ahead, Dr. Coleman saw numerous problems, including the sampling and testing of anhydrous ammonia and bulk fertilizer which is applied without being bagged. He referred to the new standards which must be set up to cover all such situations. He also saw a greater demand for more and better fertilizer to replace to a greater degree the plant food removed from the soil by harvesting crops, leaching, erosion, etc. He said that on an average only one-sixth of the removed nutrients are replaced by any kind of fertilizer materials.

Woodrum Warns Group

CLIFTON A. Woodrum, president of the American Plant Food Council, warned the group that "unless there is a very definite change in political acting and thinking," the American system of competitive enterprise is likely to suffer acutely. He discussed the general economy of the nation, pointing out that the trend toward "leaning on someone else for support" had developed to a dangerous point in the U. S., and that seeking "something for nothing" on the part of great masses of people points to hazardous times ahead.

He defended the record of the fertilizer industry which he said has done a splendid job despite severe handicaps. The fertilizer industry has been made the "whipping boy" in so-called "trust" investigations, he said, and expressed concern over the continuing threat of government to interfere with private business.

Mr. Woodrum, himself a Congressman for 23 years, assured his audience that the national lawmakers are vitally interested in knowing the problems faced by industry. He urged members of the industry to contact their Washington representatives and acquaint the legislators with facts to guide their consideration.

A strong plea for continued efforts to conserve soils in the U. S. was made by J. B. Douthit, Pendleton, S. C., president of the South Carolina Association of Soil Conservation Supervisors. He described briefly the workings of the soil conservation setup, and emphasized the need for such activity in view of the tremendous areas of the nation where soil fertility has been depleted. He expressed regret that the erosion of wind and water has been allowed to continue until so much soil is unable to hold plant food any more than a leaky container can hold water.

As an example of how a farm which was originally fertile may be "mined" for a number of years until it is nearly worthless, he related the 50 year history of a farm in South Carolina. This parcel had been used over the years without regard to soil conservation, with continually diminishing yields, until successive owners were forced to abandon it at a loss.

Finally falling into the hands of a wise owner who restored much of the fertility through cover crops and a program of fertilization, the farm was at last rehabilitated and became the source of good income for the owner.

Mr. Douthit declared in closing that American frontiers no longer lie in unexplored areas, but instead, they lie "right back home in our neglected farms."

Canadian Speaks

THE use of fertilizer in Canada was discussed by G. W. Michael, of the Canadian Department of Agriculture, Ottawa, who described the workings of Canadian control laws as compared to those of the U. S. He said that each Canadian Province has its own law and advisory board which makes recommendations to fertilizer manufacturers on the basis of investigations. The industry has cooperated very well, he declared.

Canadian regulations are quite similar to those operating in the States, he reported. Canada has no tax tags, however, and maintains a minimum plant food content of 20 percent. An annual fee of $10 apiece is charged for nitrogen, phosphorus and potash, and only one registration per brand is required.

Some figures were given on the supply situation in Canada. The domestic requirements of nitrogen, said Mr. Michael, are 30,000 tons annually, whereas some 125,000 tons are manufactured. The remaining tonnage is exported, he explained. A total of 672,000 tons of fertilizer materials was consumed in Canada last year, with the Province of Ontario using a large portion of the total.

The trend in Canada is towards fewer brands of fertilizer and higher analysis products. The latter results in a lower cost per unit of plant food, he said, and reduces the necessity for filler. There are also trends towards an awakening of interest in soil conservation in Canada, he declared. These trends, if continued, will result in greater demands for fertilizer materials.

L. G. Porter, U. S. Department of Agriculture, presented the supply picture for fertilizer materials for 1950. These figures, as presented by Mr. Porter in his article which appeared in the September issue of *Agricultural Chemicals*, gave the total supply of N as 1,010,000 tons; phosphate, 1,910,000 tons and potash, 1,025,000 tons. The combined total of 3,945,000 tons exceeds the reported consumption of plant food in 1947-48 by some 300,000 tons, he said.

Dr. A. L. Mehring, U. S. Department of Agriculture, reported an increasing trend towards the use of higher analysis fertilizer materials in the U. S. He commended the fertilizer industry for its backing the increased use of the[r] more concen-

(*Turn to Page 67*)

How nutrients removed from soil by harvested crops are replaced by

Fertilizers

PART II

This concludes the article, first part of which appeared in October's issue. Part I discussed losses of nutrients via erosion, leaching and by harvesting crops, and discussed means of restoring some of this fertility by various practices. Part II continues from this point. Ed.

by

A. L. Mehring and R. Q. Parks

Senior Chemist, Div. of Fertilizer and Agricultural Lime
Assistant Head, Div. of Soil Management and Irrigation
U. S. Department of Agriculture

IN spite of the large number of factors affecting fertility changes in soils, and their variable effect in different regions, valuable indications of trends in soil fertilty may be gained by determining the percentages of plant nutrients removed by harvesting crops that are replaced by applications of fertilizers and manures. These relationships were shown graphically for N, P_2O_5, and K_2O applications and removal on a per acre basis in Figures presented in Part I. Regional summaries of these replacement values are given in Table 6, and the figures for individual States are given in Appendix Table 5.

Table 6

Replacement of nutrients in fertilizers and manures as percentages of removal in crops, 1947

	N	P_2O_5	K_2O
		Percent	
New England	145	335	110
Middle Atlantic	146	322	115
South Atlantic	140	498	175
East North Central	92	211	106
West North Central	25	50	32
East South Central	85	218	59
West South Central	18	53	15
Mountain	53	74	33
Pacific	76	83	24
United States	59	142	63

In the United States as a whole, the P_2O_5 removed by crops not only is being replaced in the form of fertilizers and manures, but additional amounts are being applied in all regions except the West North Central, West South Central, Mountain and Pacific. On the other hand, only two-thirds of the K_2O in all crops, and three-fifths of the N that is removed from the land in non-legumes, is replaced by applications of fertilizers and manures. There are large regional differences in the values, and in the interpretations which must be placed on these relationships.

The quantities of nutrients removed by harvesting crops in 1947 were only a small fraction more than in 1937 and the quantities applied in manures are believed to have been approximately the same in both years. On the other hand, the amounts applied in fertilizers more than doubled in this decade.

It has been pointed out previously that figures such as those in Table 6 represent a range of conditions within a region and do not reflect any of the losses due to leaching, erosion, etc. The efficiency of utilization of added plant nutrients may also be as low as 10 to 50 percent, so that these apparently high replacement values are not inconsistent with the large volume of experimental data indicating that in humid areas of general crop farming, fertilizer usage could be profitably increased above present levels.

1. *Nitrogen* consumption in fertilizers in the United States has about doubled in the past ten years. Some factors that influence the farmer in his purchases of fertilizer nitrogen have been shown (5) to be: first, the relative value per acre of crop grown; second, the N content of the soil; third, the farmer's income during the previous season; and fourth, the price of fertilizer N.

The figures for the replacement of N in the South Atlantic, Middle Atlantic and New England Regions indicate that about 50 percent more N is being added in fertilizers and manures to cultivated soils than is being removed in the harvested portions of non-legume crops. Although rainfall and other sources also contribute some N to the soils of the eastern regions, loss of N by leaching is relatively great throughout this area. Although recovery of applied fertilizer nitrogen by crops is influenced by soil properties and plant characteristics, experiments indicate that in many cases in humid regions the crop recovers no more than 50 percent of the applied N fertilizer. It is very difficult to build up reserves of nitrogen in soil organic matter in well drained soils under conditions of high temperature and rainfall. Because of large but undetermined leaching losses, a replacement of N of over 100 percent is not necessarily satisfactory. Agronomic experiments indicate that on many farms throughout the humid region more N in the form of manure, commercial fertilizers, and legumes could be used profitably in crop production.

Soils in the Mountain and Pacific Regions are generally low in nitrogen and organic matter (9). Nitrogen applications are derived largely from manure (Table 5 and Appendix Table 5), in the Mountain

Region, and from commercial fertilizers in the Pacific Region. Despite the use of large amounts of manure, together with the relatively large acreages of alfalfa and other legumes, replacement of N in the western regions is not high. As a large percentage of the agricultural lands in these regions is under irrigation, an evaluation of N leaching losses would make the picture even less favorable. Recent agronomic experiments show that considerably larger amounts of N can be used in raising levels of production here also.

Less than ten percent of the nitrogen applied to crop land in both the East North Central and West North Central Regions (Table 5) is in the form of commercial fertilizers. The two regions differ markedly, however, in average replacement of nitrogen removed in crops. In the East North Central Region, 92 percent of the nitrogen removed in harvested crops is being replaced by nitrogen in commercial fertilizers or manure. Only 25 percent of the nitrogen removed by crops is being replaced in the West North Central Region. This very large difference in replacement arises from differences in the importance of legumes in the cropping systems, and corresponding differences in animal numbers and manure production. For example, in Illinois, 17.6 percent of the farm land is in alfalfa, clover and other legumes, while in Nebraska, in the West North Central Region, only 2.5 percent of the farm land is in legumes.

This unfavorable picture of N replacement in the West North Central and the West South Central Regions presents an agricultural problem of great significance. The reserves of organic N stored up in the soils of these regions are being depleted. This has been confirmed by direct studies of the decline in organic matter and N content of the soils of these regions. Analyses from a number of comparable cropped and virgin soils in 7 central States show an average loss of one-third of the original supply of soil N, with losses in some cases ranging to over 50 percent. This means that one-third of the soil organic matter also is gone, and that poor infiltration, aeration, drainage, and increased erosion hazards can be expected if such losses continue.

Although lack of adequate moisture is still the dominant factor limiting production in the western portion of these regions, long-time experiments show that the response to manure during seasons of favorable rainfall is now greater than in the earlier years of these experiments.

Excellent response to N fertilization is also being obtained in these areas with a number of grasses, particularly early season varieties. Unless adapted legumes are developed and worked into the cropping systems of the West Central States, it is probable that maintaining an adequate N balance will require the use of more fertilizer N.

2. *Phosphorus* contents of most virgin soils are too low for efficient crop production, especially under humid or irrigated conditions (9). The P_2O_5 contents of such soils need to be increased. The data for replacement of P_2O_5 removed by harvesting crops give a more nearly complete picture than those for the other principal nutrients, because of the smaller magnitude of P_2O_5 leaching losses. The data in Table 6 indicate that for the eastern United States, replacement by fertilizers and manures of P_2O_5 removed in harvested crops varies from 200 percent in the East North Central Region, to nearly 800 percent in the South Atlantic Region. The percentage recovery of applied P_2O_5 is generally quite low as contrasted with recovery of applied N and K_2O. One of the most important causes is the natural P_2O_5 fixing powers of practically all soils. Even though 5 to 10 times as much P_2O_5 must often be added to the soil as the crop is expected to take up, this soil fixation of P_2O_5 must be considered in part as a decreased rate of availability. As this residual P_2O_5 builds up, part of it is available to later crops, so that in subsequent years rates of applied P_2O_5 may be decreased. It has been demonstrated (1) that large reserves of readily available P_2O_5 can be accumulated in the soil.

In the Middle Atlantic and South Atlantic Regions, tobacco, citrus, and vegetable crops receive much higher rates of P_2O_5 application than cotton, corn, and other field crops. For example, in Florida ten times as much P_2O_5 is added to the soil as is being removed from the land in crops, but most of this P_2O_5 is applied to citrus and vegetable crops. Practically all of the added P_2O_5 in Florida is in the form of commercial fertilizer.

Replacement of P_2O_5 to soils in the New England Region is also relatively favorable, but this is due in part to large per acre applications of manure. For example, Rhode Island farmers are applying about seven times as much P_2O_5 as they are removing in harvested crops, and in this State roughly half of the addition is in the form of manures, and half as commercial fertilizers. (Appendix Table 5).

The replacement of P_2O_5 in the Pacific States (now 83 percent) will doubtless increase with the expanding use of fertilizers in this region. An increasing number of instances of response to phosphate fertilization on irrigated lands are being reported, although in other irrigated areas crops still give no response. Many of the soils in the Western Region contain supplies of P_2O_5 in forms that are comparatively unavailable.

Phosphate usage and recovery problems in the East South Central Region are very similar to those of the South Atlantic States. On the other hand, the West Central States, whether in the North or South, have the lowest rates of P_2O_5 replacement in the country, except Nevada. Typical of this extreme is North Dakota, where only 14 percent of the P_2O_5 removed is being replaced. Studies now being made of organic matter levels in the soils of the Plains states from Montana and North Dakota to Texas indicate that much organic matter has been lost since this land came under cultivation. The levels of P_2O_5 and N of these soils are de-

claiming but as yet there is only limited experimental evidence of crop response to N or P_2O_5 fertilization in the dry land areas of the Plains States. Continued depletion of P_2O_5 reserves eventually will result in inadequate supplies of this nutrient for satisfactory crop growth.

3. *Potassium* in available forms is present in many soils of warm humid regions in too small amounts for efficient crop production. Nearly twice as much K_2O is being returned to the soils of the South Atlantic Region as is being removed in the form of harvested crops. The soils of this region, and of the East South Central Region, are highly weathered.

The release of potassium from native mineral to available forms is a relatively minor factor in maintaining the K_2O supply of these regions, although it is substantial in some parts of the Piedmont and the Mountain Valleys. The need for replacing the K_2O removed in crops is probably greater in this area than in any other region in the country. Most of the soils have relatively low exchange capacities, and are subject to leaching losses from heavy rainfall throughout the year. The rapid increase in acreage of legumes raised, together with the growing recognition of K_2O requirements of such crops, will increase the usage of K_2O fertilizers in these regions.

The replacement of available K_2O in the soils of the New England, Middle Atlantic, and East North Central Regions is indicated as approximately 100 percent (Table 6). This is no assurance of operation at high enough levels of K_2O supply, and involves averages of truck crops with general farm land. Although there are some K_2O leaching losses, most of the soils of this area release from 25 to 50 or more pounds of K_2O per acre per year. This replacement of available K_2O from mineral reserves is an important factor in maintaining the supply of available K_2O in the soils of these regions.

Farmers of the West North Central, West South Central, and Pacific Regions are expected to continue for a number of years to replace only about one-third of the K_2O removed from their soils in crops. The soils of these regions are only slightly weathered, are high in K_2O bearing minerals, and readily release K_2O from mineral to available form (10). Current experimental work indicates that large applications of K_2O fertilizer are unnecessary to maintain satisfactory levels of available K_2O in most of the soils of these regions as well as the Mountain Region.

Summary

1. Data on removal and addition of the plant nutrients N, P_2O_5, and K_2O by harvesting crops and applying fertilizers and farm manures are discussed in the light of soil characteristics and agronomic practices.

2. Large regional differences exist in the replacement rate by fertilizers and manures of plant nutrients removed in harvested crops. Marked differences in soils, rates of fertilizer application, and soil management practices within a region or a State permit only general conclusions.

3. In the East North Central, Middle Atlantic, and New England Regions, manure applications are a major factor in the replacement of nitrogen removed by harvesting crops, about equal to fertilizers for K_2O, and a less important factor for P_2O_5.

4. Nitrogen leaching losses, and decline of soil organic matter levels make the nitrogen replacement picture the least favorable of those discussed.

5. The replacement of K_2O in fertilizers and manures can be considered as relatively more favorable than for N, due to the release of native soil K_2O by mineral weathering, especially in the western half of the country.

6. The P_2O_5 replacement values in relation to removal do not include losses by erosion or reduced availability due to P_2O_5 fixation, and reflect the low rate of crop efficiency in utilization of applied P_2O_5.

Literature Cited

1. Cummings, R. W., Peech, Michael, and Hawkins, Arthur. Nutrient status of soils in commercial potato producing areas of the Atlantic and Gulf Coast. Parts 1, 2 and 3. Soil Sci. Soc. Amer. Proc. 10:240-256. 1946.
2. Erdman, L. W. Legume inoculation. U.S.D.A. Farmers' Bul. 2003. 1948.
3. Gustafson, A. F. Soils and soil management. New York: McGraw-Hill Book Co. 1941.
4. Lipman, J. G., and Conybeare, A. B. Preliminary note on the inventory and balance sheet of plant nutrients in the United States. N. J. Agr. Exp. Sta. Bul. 607. 1936.
5. Mehring, A. L. Fertilizer nitrogen consumption. Ind. and Eng. Chem. 37:289-295. 1945.
6. ————, Wallace, H. M., and Drain, Mildred. Nitrogen, phosphoric acid, and potash consumption in the United States. Jour. Amer. Soc. Agron. 37:595-609. 1945.
7. Morrison, F. B. Feeds and feeding. Ithaca, N. Y.: Morrison Pub. Co., Ed. 20. 1936.
8. National Fertilizer Assoc. Third national fertilizer practices survey. Wash., D. C. 1946.
9. Parker, F. W. Manure and fertilizers. Am. Fert. 72(9):19-23. 1930.
10. ————, Adams, J. R., Clark, K. G., Jacob K. D., and Mehring, A. L. Fertilizers and lime in the United States. U.S.D.A. Misc. Pub. 586. 1946.
11. Scholl, Walter, and Wallace, Hilda M. Fertilizer consumption in the United States for year ending June 30, 1947. Agr. Chemicals 3(6):24-29, 59. 1948.
12. Scholl, Walter, Wallace, Hilda M., and Mehring, A. L. Fertilizer consumption in the United States for year ending June 30, 1946. Commercial Fert. Yrbk. 1947. 75(6-A): 69-76.
13. Stallings, J. H. Estimates of tons of N, P_2O_5, and K_2O contained in major crops harvested in continental U. S. in 1943 by States. U.S.D.A. Office of Prodn. mimeo. 1944.
14. U. S. Department of Agriculture. Annual summary 1947 acreage, yield, and production of principal crops. Crop Reptg. Bd. 1948.
15. ———— Annual summary 1947 commercial truck crops for fresh market. Crop. Reptg. Bd. 1948.
16. ———— Livestock on farms Jan. 1. Crop Reptg. Bd. 1948.
17. ———— Truck Crops for commercial processing, acreage, production and value 1947 with comparisons. Crop Reptg. Bd. 1948.
18. ———— Agricultural conservation program statistical summary 1946. Agr. Conservation Programs Br. 1948.
19. Utz, E. J., Kellogg, Charles E., Reed, E. H., Stallings, J. H., and Munns, E. H. Soils and men. U.S.D.A. 1938 Yrbk. of Agr., 84-110.
20. Van Slyke, L. L. Fertilizers and crop production. New York: Orange Judd Pub. Co. 1932.
21. Winton, A. L., and Winton, K. B. The structure and composition of foods. London, England: John Wiley and Son. 1932.

APPENDIX
Nutrients Added in Commercial Fertilizers

THE quantities of plant nutrients supplied to the soils of each State are available in the literature for a number of years (6, 11, 12). The figures of Scholl and Wallace (11) for the fiscal year ending June 30, 1947, the latest available, are used in the preparation of Table 3 and Appendix Table 2 of this report.

In the present study, deductions have been made for the fertilizer used on pastures. The Third National Fertilizer Practices Survey (8) gives detailed information on the usage of plant nutrients on pastures in 1944. The quantities applied to pastures in 1947, as shown in Appendix Table 2, are estimated from these 1944 data, and the 1946 Agricultural Conservation Program (18) on pastures. The estimates for pastures deducted from the totals given by Scholl and Wallace (11) are assumed to be the tonnages applied to harvested crops.

The Agricultural Conservation Program (18) was responsible for the larger part of the nutrients applied to pastures. In 1946, this program used 155,966 tons of available P_2O_5 and 11,794 tons of K_2O, as compared with the total applications to pastures in 1947 of 14,000 tons N, 183,000 tons of P_2O_5 and 18,000 tons of K_2O.

Nutrients Added in Manures

Parker (9) estimated that in 1927 900,000 tons of N, 450,000 tons of P_2O_5, and 900,000 tons K_2O in the form of manures were applied to crop land in the United States. Lipman and Conybeare (3) estimated that in 1930 the animal manures applied to crop land contained 947,000 tons of N, 645,000 tons of P_2O_5, and 725,000 tons of K_2O. Estimates for 1947 made as a part of this study indicate that 1,300,000 tons of N, 796,000 tons of P_2O_5, and 1,102,000 tons of K_2O were applied in the form of animal manures to harvested crops.

The total production of animal manures including bedding in 1947 in the continental United States was about 1,371,059,000 tons as compared with 1,267,603,000 tons in 1937 and 1,279,324,000 tons in 1927. From 1927 to 1947 the production of animal manure increased 7 percent, but the data above indicate that the nutrients applied to harvested crop land in the form of animal manures increased 42 percent. Although farmers are doubtless making somewhat

APPENDIX TABLE 1

Estimates of the plant food removed from the soil by harvesting 100 principal crops in 1947, by States.

STATE AND REGION	NITROGEN			Phosphoric Oxide	Potash
	Legumes	Non-Legumes	100 Crops		
	Tons	*Tons*	*Tons*	*Tons*	*Tons*
Maine	5,477	17,311	22,788	7,099	24,879
New Hampshire	2,644	5,214	7,858	2,354	7,359
Vermont	10,696	15,702	26,398	7,842	24,630
Massachusetts	4,500	6,547	11,047	3,287	10,536
Rhode Island	337	886	1,223	381	1,152
Connecticut	3,904	6,239	10,143	2,883	9,465
New England	27,558	51,899	79,457	23,846	77,821
New York	66,119	66,355	132,474	40,523	115,064
New Jersey	6,360	9,847	16,207	5,378	14,002
Pennsylvania	45,044	68,001	113,045	38,336	77,604
Delaware	2,474	3,427	5,901	2,214	3,175
Maryland	9,546	17,363	26,909	9,658	17,290
West Virginia	9,062	14,174	23,236	7,480	17,571
Middle Atlantic	138,605	179,167	317,772	103,598	244,706
Virginia	28,303	33,803	62,106	20,444	39,316
North Carolina	34,792	64,319	99,111	30,327	63,803
South Carolina	10,672	33,387	44,059	15,686	22,374
Georgia	41,975	42,195	84,170	27,409	36,278
Florida	5,533	11,300	16,833	6,151	15,746
South Atlantic	121,275	185,004	306,279	100,017	177,537
Ohio	75,707	113,079	188,786	67,954	98,873
Indiana	78,695	124,339	203,034	74,866	89,840
Illinois	161,221	212,042	373,263	135,881	158,223
Michigan	68,373	66,597	134,970	42,637	92,814
Wisconsin	100,772	116,151	216,923	68,058	181,536
East No. Central	484,768	632,208	1,116,976	389,396	561,295
Minnesota	85,004	218,248	303,252	105,898	150,071
Iowa	115,198	220,319	335,517	119,521	159,560
Missouri	81,810	84,943	166,753	57,200	102,377
North Dakota	6,881	206,404	213,285	86,936	76,624
South Dakota	16,603	159,727	176,330	66,420	88,090
Nebraska	52,531	187,893	240,424	85,805	135,515
Kansas	55,045	251,784	306,829	122,962	152,761
West No. Central	411,072	1,329,318	1,740,390	644,808	865,824
Kentucky	46,733	50,934	97,667	30,453	70,059
Tennessee	43,540	42,511	86,040	28,451	59,602
Alabama	18,419	37,369	55,788	19,334	25,502
Mississippi	18,594	47,060	65,654	23,152	33,687
East South Central	127,295	177,874	305,169	101,390	185,850
Arkansas	27,859	40,208	68,067	22,655	39,407
Louisiana	6,125	26,248	32,373	12,900	16,998
Oklahoma	27,856	115,650	143,506	54,850	75,385
Texas	22,869	237,882	260,751	101,613	122,593
West South Central	84,709	419,988	504,697	192,018	254,381
Montana	36,032	75,674	111,706	38,716	71,925
Idaho	56,624	44,870	101,494	30,121	77,938
Wyoming	17,407	20,189	37,596	10,879	30,485
Colorado	39,612	80,837	120,449	41,265	84,016
New Mexico	11,130	12,550	23,680	7,306	16,285
Arizona	12,428	10,624	23,052	6,355	19,367
Utah	22,849	14,160	37,009	9,870	32,498
Nevada	7,421	6,196	13,617	3,387	13,002
Mountain	203,503	265,100	468,603	147,893	345,516
Washington	28,164	56,641	84,805	30,903	47,550
Oregon	19,058	40,889	59,947	19,842	43,147
California	118,586	108,294	226,880	61,620	196,552
Pacific	165,808	205,824	371,632	112,365	287,249
United States	1,764,593	3,446,382	5,210,975	1,815,331	3,060,179

[1] Calculated from the production of the 100 principal crops (14, 15, 16) and the average chemical composition of each. The composition of feeds was obtained from Morrison (7), that of food from Winton and Winton (21), and that of other crops from Van Slyke (20). The weights used in converting production in sacks, bushels, crates and other measures into tons are given on p. 4, Agricultural Statistics 1946, U.S.D.A. The actual results of the calculations are given, but only the first two or three digits of each number are significant.

better use of manure now than they did two decades ago, there are obviously major differences in the manner in which these estimates were made.

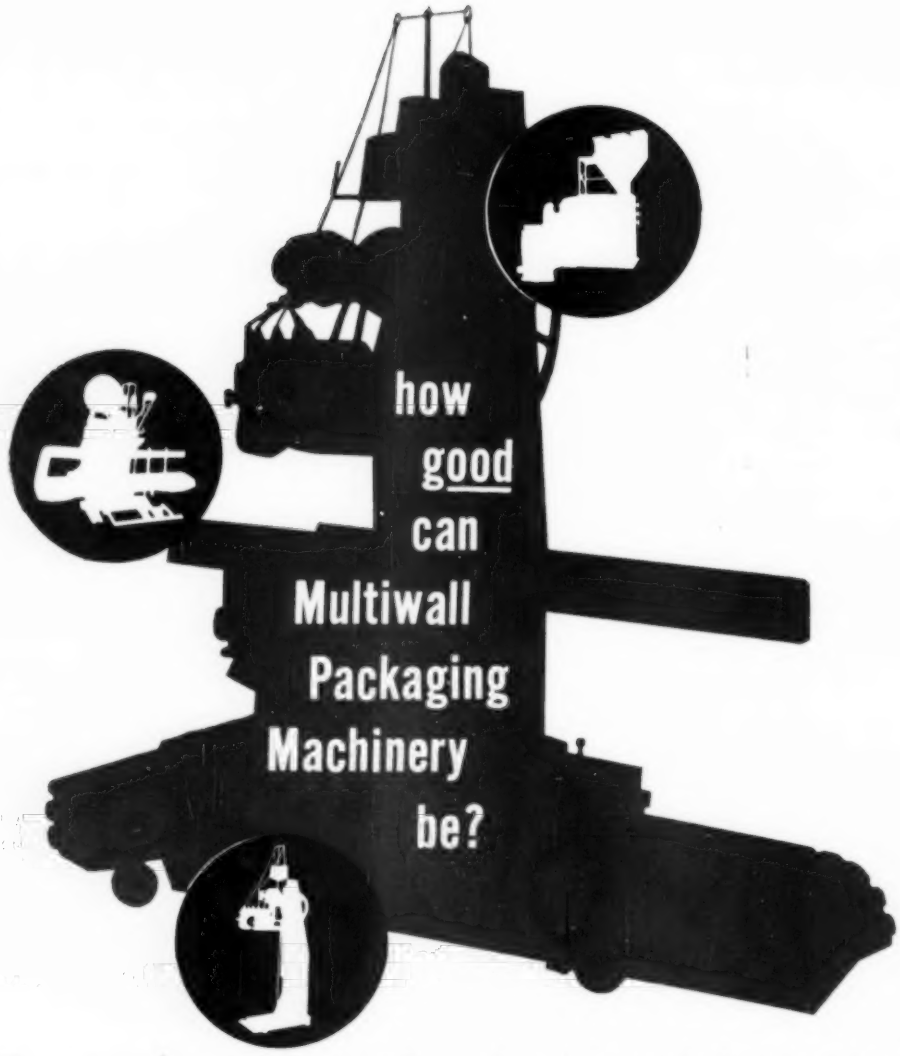
Lipman and Conybeare (4) did not give the basis of their estimates but Parker (9) did. More assumptions were necessary in these earlier studies because the data of the first N.F.A. Fertilizer Practices Survey were available only for 22 States. The more recent survey by the N.F.A. (8) gives data for nearly all States. Parker assumed that manure contained 0.40 percent N, 0.25 percent P_2O_5 and 0.40 per cent K_2O. These figures are satisfactory for cattle manure in the East, but there are two objections to their use for all manures. First, only two-thirds of the entire production is cattle manure. The other one-third of the total consists principally of horse, mule, hog, sheep,

APPENDIX TABLE 2

Estimates[1] of nutrients applied as fertilizers to pastures and to harvested crops, 1947, by States.

STATE AND REGION	NITROGEN		AVAILABLE PHOSPHORIC OXIDE		TOTAL PHOSPHORIC OXIDE		POTASH	
	Pastures	Harvested Crops	Pastures	Harvested Crops	Pastures	Harvested Crops	Pastures	Harvested Crops
	Tons	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*
Maine	615	12,700	974	25,665	1,013	26,960	611	27,344
New Hampshire	268	683	750	2,167	780	2,295	482	1,132
Vermont	268	830	2,177	5,372	2,264	5,784	1,155	1,266
Massachusetts	940	3,435	1,343	6,783	1,401	7,167	908	4,708
Rhode Island	6	750	600	1,316	625	1,388	6	1,220
Connecticut	355	4,851	921	6,090	959	6,433	824	4,624
New England	2,461	23,318	6,765	47,394	7,042	50,027	3,986	40,154
New York	2,212	18,998	10,466	67,136	11,218	70,612	322	27,119
New Jersey	172	11,921	1,604	28,550	1,676	29,995	674	21,055
Pennsylvania	167	17,142	6,205	65,852	6,466	69,354	428	32,984
Delaware	26	2,031	551	5,635	576	6,000	123	4,325
Maryland	189	9,225	3,131	27,270	3,266	28,655	680	17,348
West Virginia	143	1,933	6,012	8,990	6,271	9,491	45	3,008
Middle Atlantic	2,909	61,250	28,269	203,442	29,473	214,136	2,272	105,928
Virginia	796	22,060	15,676	60,925	16,319	73,579	578	31,702
North Carolina	1,496	79,135	7,894	149,321	8,265	159,883	1,610	95,942
South Carolina	151	45,948	4,185	75,442	4,373	79,247	304	47,815
Georgia	273	55,220	12,114	100,878	12,599	112,381	1,833	65,011
Florida	693	37,722	4,334	59,015	4,507	63,917	533	54,319
South Atlantic	3,409	240,085	44,203	445,581	46,063	489,007	4,858	294,849
Ohio	241	19,319	2,822	96,071	2,943	101,988	577	53,892
Indiana	515	14,125	1,572	79,067	1,643	94,803	553	52,495
Illinois		10,529	2,200	55,484	2,552	198,463	100	20,034
Michigan	16	10,073	8,845	43,315	9,288	46,294	738	26,817
Wisconsin	3,388	5,719	2,822	44,689	2,949	49,754	1,790	29,395
East No. Central	4,160	59,765	18,262	319,256	19,375	491,372	3,758	191,633
Minnesota	10	4,342	2,833	24,169	2,946	25,450	417	9,911
Iowa	5	7,197	1,417	31,175	1,484	37,844	583	10,233
Missouri	4	5,691	2,732	40,093	2,844	44,965	114	11,452
North Dakota		382	100	2,748	104	3,072		1,043
South Dakota		156	30	757	31	1,035	10	147
Nebraska		2,134		2,264		2,452		40
Kansas		2,393	600	13,446	624	14,658		1,134
West No. Central	19	22,295	7,712	115,252	8,033	130,506	1,124	33,960
Kentucky	38	13,050	8,761	38,439	9,111	46,313	201	17,130
Tennessee	67	16,100	10,810	44,244	11,264	46,543	123	16,386
Alabama	413	43,773	13,578	81,442	14,210	85,567	559	40,125
Mississippi	198	56,073	13,476	28,953	14,055	30,496	126	17,700
East So. Central	716	129,005	46,625	193,078	48,646	208,919	1,009	91,341
Arkansas	50	18,950	4,000	18,688	4,160	19,678	130	11,001
Louisiana	147	22,063	5,221	20,179	5,430	21,408	252	7,109
Oklahoma		1,447	1,600	4,203	1,664	10,630		964
Texas		21,284	11,000	40,100	11,440	44,724	200	9,900
West So. Central	197	63,744	21,821	83,170	22,694	96,440	582	29,054
Montana		338	100	4,192	104	4,403		39
Idaho	20	2,403	300	9,925	315	10,421		1,251
Wyoming		24		1,338		1,405		9
Colorado	5	2,360	100	4,819	105	5,060		325
New Mexico		527		3,950		4,147		46
Arizona		5,930		7,411		7,782		84
Utah	25	732	200	4,805	210	5,045		135
Nevada		30	15	185	16	194		5
Mountain	50	12,359	715	36,625	750	38,457		1,894
Washington	119	7,710	2,981	7,961	3,115	8,386		3,540
Oregon	100	7,664	2,100	9,603	2,195	10,093		2,803
California	167	98,720	3,833	48,170	4,005	50,598		24,364
Pacific	386	114,094	8,914	65,734	9,315	69,077		30,773
United States	14,307	725,915	183,286	1,524,532	191,391	1,784,921	17,589	819,567

[1] The sum of the applications on pastures and harvested crops equals the consumption given by Scholl and Wallace (11).



WITH BAGPAKERS ON THE JOB, packaging machinery can be as good as you *want* it to be. Bagpakers are ace performers . . . designed for simple or complex operations according to your needs. If your requirements are moderate — merely calling for a semi-automatic closing unit which provides tough, tight "cushion-stitching" at high production rates—Bagpaker E-1 or F-1 is the machine for you. If, on the other hand, you pack heavy tonnage —then the fully-automatic, multi-station Bagpaker (Model A) —handling 25 to 45 tons per hour — is your perfect packager.

Bagpakers will package food, chemicals or fertilizer faster and easier at a surprisingly small investment on your part. Get acquainted today with the many Bagpak machines and Bagpak Multiwall bags. Write for descriptive pamphlets E-1, F-1, DA and A.

BAGPAK
DIVISION

INTERNATIONAL PAPER COMPANY, Bagpak Division
220 EAST 42nd ST., NEW YORK 17, N. Y.

BRANCH OFFICES: Atlanta, Baltimore, Boston, Chicago, Cleveland, Baxter Springs, Kansas, Los Angeles, New Orleans, Philadelphia, Pittsburgh, St. Louis, San Francisco.
In Canada: Continental Paper Products, Ltd., Montreal, Ottawa

goat, and poultry manure, all of which generally contain larger percentages of plant nutrients than cattle manure. For example, the average analysis of many samples of poultry manure is 1.61 percent N, 1.20 percent P_2O_5, and 0.67 percent K_2O. Second, any kind of manure in the western half of the country usually contains more plant nutrients per ton at the time of application to crop land, because of greater drying and smaller leaching losses.

The quantities of manure produced by States were determined from the number of animals on farms January 1, 1947 (16), the estimated average weight per animal, the quantity of excrements voided per 1,000 pounds of live weight annually by each kind, and the average weight of bedding, as given by Van Slyke (20).

When the average analyses of each kind of manure after storage are weighted by the number of tons of each kind applied to crops, the weighted average of all farm manures is 0.66 percent N, 0.40 percent P_2O_5, and 0.52 percent K_2O. On this basis the former estimates of the plant nutrients applied in manures to harvested crops appear to have been too low. If the weighted average just given had been used by Parker, the rate of application obtained for 1927 would be about the same as the present one.

The quantities of manure applied to each of the principal crops in each State were obtained in a survey by the National Fertilizer Association (8). The N.F.A. survey gives the percentages of the acres that were manured and the average numbers of tons of manure used per manured acre. About 25,000 farmers were interviewed in the survey, and the number is considered adequate to give a fair sample for most states. The number of questionnaires filled out for New Hampshire, Vermont, Rhode Island, West Virginia, and several of the Mountain States was rather small.

The estimate of the total tons of manure applied to crops in each state in the preliminary report of our study was prepared by weighting the figures in the N.F.A. survey by the acres of each crop reported and then multiplying this weighted average figure by the number of acres of crop land in the state. If the sample ob-

(Turn to Page 77)

APPENDIX TABLE 3

Estimated production[1] of manure, utilization of manure on harvested crops and its plant nutrient content in 1947, by States.

STATE AND REGION	Manure Production	MANURE APPLIED TO HARVESTED CROPS				
		UTILIZATION		NUTRIENT CONTENT		
				Nitrogen	Phosphoric Oxide	Potash
	1000 Tons	1000 Tons	Percent of Production [2]	1000 Tons	1000 Tons	1000 Tons
Maine	3,300	870	26	4.9	2.8	4.3
New Hampshire	1,700	400	24	2.2	1.3	2.0
Vermont	5,700	4,100	72	23.0	13.1	20.1
Massachusetts	3,000	1,700	57	9.5	5.4	8.3
Rhode Island	410	400	98	2.2	1.3	2.0
Connecticut	2,400	1,800	75	10.1	5.8	8.8
New England	16,500	9,300	56	51.9	29.7	45.5
New York	28,700	13,400	47	76.4	45.6	67.0
New Jersey	3,400	740	22	4.2	2.5	3.7
Pennsylvania	26,400	16,200	61	92.3	55.1	81.0
Delaware	1,100	530	48	3.0	1.8	2.7
Maryland	6,800	2,400	35	13.7	8.2	12.0
West Virginia	9,600	1,800	19	10.3	6.1	9.0
Middle Atlantic	76,000	35,070	46	199.9	119.2	175.4
Virginia	19,000	1,300	7	7.2	4.4	6.2
North Carolina	17,800	910	5	5.0	3.1	4.4
South Carolina	9,800	330	3	1.8	1.1	1.6
Georgia	24,900	640	3	3.5	2.2	3.1
Florida	18,200	310	2	1.7	1.1	1.5
South Atlantic	89,700	3,490	4	19.2	11.9	16.8
Ohio	43,500	14,400	33	83.5	53.3	70.6
Indiana	43,000	9,900	23	57.4	36.6	48.5
Illinois	69,500	26,000	37	150.8	96.2	127.4
Michigan	29,000	11,000	38	63.8	40.7	53.9
Wisconsin	57,000	28,000	49	162.4	103.6	137.2
East No. Central	242,000	89,300	37	517.9	330.4	437.6
Minnesota	62,000	22,000	35	134.2	83.6	110.0
Iowa	115,000	12,400	11	75.6	47.1	62.0
Missouri	60,700	5,900	10	36.0	22.4	29.5
North Dakota	24,700	2,500	10	15.2	9.5	12.5
South Dakota	42,100	3,000	7	18.3	11.4	15.0
Nebraska	62,000	3,000	5	18.3	11.4	15.0
Kansas	51,800	1,500	3	9.2	5.7	7.5
West No. Central	418,300	50,300	12	306.8	191.1	251.5
Kentucky	29,800	640	2	3.6	2.0	3.2
Tennessee	28,100	2,800	10	16.0	9.0	14.0
Alabama	24,300	310	1.3	1.8	1.0	1.6
Mississippi	29,500	130	0.4	0.7	0.4	0.6
East So. Central	111,700	3,880	3.5	22.1	12.4	19.4
Arkansas	23,200	880	4	5.0	2.8	4.4
Louisiana	24,600	120	0.5	0.7	0.4	0.6
Oklahoma	39,400	700	1.8	4.0	2.2	3.5
Texas	130,000	310	0.2	1.8	1.0	1.6
West So. Central	217,200	2,010	0.9	11.5	6.4	10.1
Montana	27,000	1,900	7	22.6	12.5	19.4
Idaho	14,400	2,200	15	26.2	14.5	22.4
Wyoming	16,700	1,300	8	15.5	8.6	13.3
Colorado	25,500	2,600	10	31.0	17.2	26.5
New Mexico	16,900	2	0.01	0.02	0.01	0.02
Arizona	12,300	1	0.008	0.01	0.007	0.01
Utah	9,600	2,700	28[3]	32.1	17.8	27.5
Nevada	7,000	0.5	0.007	0.01	0.003	0.005
Mountain	129,400	10,700	8	127.4	70.6	109.1
Washington	12,600	700	5	8.3	4.6	7.1
Oregon	15,100	300	2	3.6	2.0	3.1
California	41,600	2,000	6	30.9	17.2	26.5
Pacific	69,300	3,000	5	42.8	23.8	36.7
United States	1,370,000	208,000	15	1,300	790	1,102

[1] For methods of computation see text under "Nutrients added in Manures." The data have been rounded off according to the degree of accuracy believed to be warranted.

[2] This is merely the relation between the figures in the preceding two columns. It does not represent the proportion of nutrients in the total excrements that are utilized on crop land. The percent of nutrients would be a much smaller figure due to decomposition and leaching losses.

[3] The value for Utah may be too high. There is some evidence to indicate that the sample data for Utah did not include a large acreage of dry land wheat, on which little or no manure is used.

Doing one job well for 90 years...

MANUFACTURING PAPER BAGS

Recent Products from the A & S Packaging Laboratory

SHUR-CLOSE VALVE — Tests made in plants all over the country have proved that SHUR-CLOSE valve bags insure less dusting when packing and less sifting when packed. Consumers are requesting shipments in SHUR-CLOSE valve bags because they prevent waste; while operating men in packing rooms claim SHUR-CLOSE bags eliminate objectionable dust.

STA-STAK BAG — It's the specially designed outer creped sheet that does the trick. STA-STAK creped paper takes the skid and slip out of piling, stacking and palletizing. The STA-STAK construction gives greater resiliency to withstand shocks and general abuse better than ordinary multiwall bags. And they handle easier . . . the crinkly surface provides a hand-hold that workmen appreciate.

SUPER-GLOSS FLOUR BAG — The SUPER-GLOSS flour bag was developed by the A & S packaging laboratory with the help of the country's largest mills. The long fibered white kraft sheet combined with a blue kraft liner makes the toughest 25 lb. flour bag on the market. The SUPER-GLOSS clay coated sheet gives this bag exceptional whiteness and keeps ink on the surface, producing a sparkling, appealing shelf package.

ARK-TONE PRINTING — A&S has also perfected developments kindred to the field of paper bag making. The new A&S ARK-TONE PRINTING is a case in point. No other commercial bag printing can touch this ARK-TONE process for printing fidelity. Users report increased sales of ARK-TONE printed bags because strong, sharp, clear colors give package greater shelf appeal. ARK-TONE process printing is the only type of commercial bag printing to combine product reproduction and color brightness.

PLASTO-PAK BAG — This is the very latest development from the A&S packaging laboratory. PLASTO-PAK bags have a polyethylene kraft liner which affords completely moisture-proof protection to hygroscopic materials. Many acids and other strong chemicals, when packed in the PLASTO-PAK bag fail to attack the liner. A special "Electro-Seal" patent applied for, closes off the needle holes at the bottom of the bag . . . no other multiwall has this feature.

YOU don't build a good name over night. It only comes as the result of doing a good job for a long time. After that, people begin to expect quality workmanship from you and bring their business to you for that reason.

Since 1859, we have been building a fine reputation throughout American industry and are proud of our claim . . . "The oldest name in paper bags." Styles and designs can be copied, but the integrity of a company and the quality built into its products cannot be imitated.

ARKELL & SMITHS · THE OLDEST NAME IN PAPER BAGS ·

90 YEARS OF KNOW HOW

CANAJOHARIE, N. Y. • WELLSBURG, W. VA. • MOBILE, ALA.

Tentative Program for Tampa A.A.E.E. Meeting Features Studies of Current Insecticide Problems

ALTHOUGH program plans were not entirely completed at press time, a sufficient outline was available to indicate an excellent meeting for the American Association of Economic Entomologists at the Tampa Terrace Hotel, Tampa, Fla., December 13-16, inclusive. The convention, to be held jointly with the Entomological Society of America, the Cotton States Branch of the A.A.E.E., and the Florida Entomological Society, is to open with registration promptly at 8:30 the morning of the 13th.

The meeting proper will begin at 10, in a joint session with the E.S.A., featuring an address by Dr. A. M. Boyce, Riverside, California, president of the A.A.E.E. Concurrent sessions are scheduled for the afternoon, with business sessions on the agenda for the Cotton States Branch and for the Florida Entomological Society. The section on medical entomology will meet at the hotel's Palm Room and the section on insects affecting vegetables will meet in the Scottish Rite Temple nearby. The section on apiculture also meets concurrently Tuesday afternoon. The concurrent sessions will continue into the evening with a section on Plant Pest Control and Quarantine being added to the program.

A full day is scheduled for Wednesday, beginning at 9 a.m., with joint sessions of the A.A.E.E. and E.S.A. in the Palm room. Invitational papers will be presented, and a representative of the Entomological Society will talk. Dr. P. N. Annand, Chief, Bureau of Entomology and Plant Quarantine, U.S.D.A., Washington, D. C., will speak on "Quarantines and Control Programs to Prevent Introduction and Spread of Insect Pests," followed by Dr. R. E. Metcalf, California Citrus Experiment Station, who is scheduled to discuss the physiological and toxicological action of insecticides.

"The Relation between Entomological Research and Other Phases of Crop Production" is to be discussed by Dr. A. F. Camp, vice-director, Florida Citrus Experiment Station; and Dr. Orton, University of W. Virginia, Morgantown, will report on the working relationship between entomologists and plant pathologists.

Wednesday afternoon will feature an important section on insecticides in the Palm Room, with general sessions beginning at 1:30. These are to continue until 3, at which time panel discussions on insecticidal subjects will be presented. The advance program stated that the section on insecticides would probably be divided into separate groups in order to allow time for discussion of special topics. Concurrently, another section, meeting in the Scottish Rite Temple, will hear submitted papers on insects affecting forests and ornamentals.

A social and cocktail hour from 6 to 7 p.m. will be followed by the annual Entomologists' Dinner. A dance is scheduled for the remainder of the evening.

Residue Studies Planned

A SPECIAL session on chemical residues in plant and animal products will be a feature of Thursday morning's program. This session will include discussions covering chemical residues in meat and milk following application of insecticides to livestock; studies on chemical residues in meat and milk, by representatives of the Kerrville, Texas, laboratories; chemical residues in milk of dairy cows consuming insecticide in feeds by representatives of the Bureau of Dairy Industry, U.S.D.A.; chemical residues in meat and milk from livestock consuming insecticides in feed, by Dr. Biddulph, University of Utah; a resume of insecticide residue studies in California; and chemical and biological assays of insecticide residues on various crops, by Dr. George C. Decker and Dr. Weinman, University of Illinois, Urbana.

A report on chemical residue studies in Wisconsin will be presented by Dr. Fisher, and a representative of the Food and Drug Administration is expected to appear on the program to discuss "Some Aspects of Residue Problems." Running concurrently with the toxicological discussions, will be another special session on biological control of insect pests.

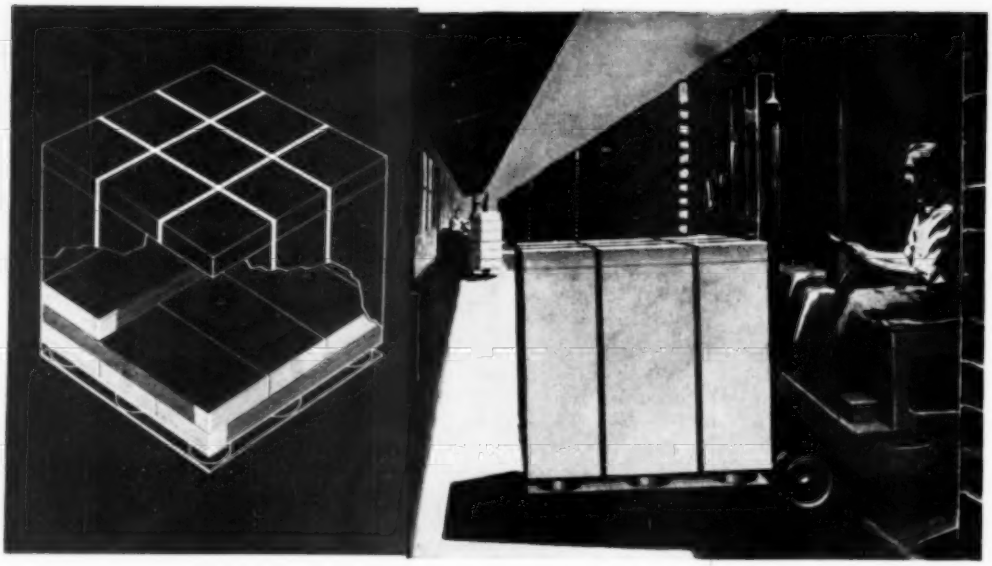
The afternoon of Thursday will be occupied by submitted papers on insects affecting fruits; and sections on teaching and extension. Concurrently, the Florida Pest Control Association will hold a meeting in the Floridan hotel.

Friday's sessions are to begin with business meetings of the Cotton States Branch, the Florida Entomological Society and the A.A.E.E. Following immediately will be two concurrent sessions covering insecticide equipment and insecticide resistant insects.

Equipment Discussed

THE program for the equipment section will feature a number of reports by experts in the field. Earl D. Anderson, Secretary of the National Sprayer and Duster Association, Chicago, will talk on recent developments and trends in the use of light insecticide equipment. H. G. Ingerson, of the Committee on Pesti-

(Turn to Page 65)



Your

Union Multiwall Specialist

will show you how to make Handling Labor more productive

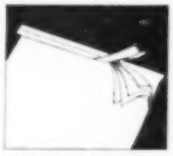
ONE of the hidden costs in packaging is in the handling of packaging materials from unloading dock to warehouse to packaging assembly line.

Thanks to new ways of shipping and handling, many firms now find savings in handling costs alone more than justify a switch to Union Multiwall Bags. The Union Multiwall Specialist who calls on you, can tell you all about the recent cost-cutting developments in handling of multiwall bags.

He'll show you, too, why more than 300 industries now find Union Multiwall Bags cut packaging costs all along the line—in handling, packaging, shipping—yes, and in better product protection, too.

Even if you're now using multiwall bags, the Union representative who calls on you can give you new ideas to save money. For he is backed by the skilled engineers and packaging experts of America's largest maker of paper bags.

Let him show you how Union resources and packaging experience can help you!



Multiple Protection

Opens Easily

Prevents Siftage

Empties Clean

UNION Multiwall Bags

UNION BAG & PAPER CORPORATION

233 BROADWAY, NEW YORK 7, NEW YORK

Offices in: CHICAGO, ILL. - NEW ORLEANS, LA. - MINNEAPOLIS, MINN. - KANSAS CITY, MO. - HOUSTON, TEXAS

TRADE MARK UNION

How the Residue Hearings May Influence Plans of the

Insecticide Industry

by

Melvin Goldberg

Pesticide Advisory Service
New York City, N. Y.

WHAT immediate and long range effects on the pesticide industry are likely to result from the Food and Drug Administration hearings on insecticides and other residual tolerances, scheduled to begin in January? This appears to be the foremost question on the minds of many industry representatives with whom the subject has been discussed.

Most of these persons were of the opinion that there would be but little effect on industry . . . at first. However, realizing the complexity and the number of problems involved, plus the possibility that the hearings may continue for a year or more, the consensus was that the 1950-51 season will probably be the first in which any direct effect will be noted.

But even now, certain indirect results are apparent. The very fact that the hearings have been announced officially, has tended to remove some of the tension in the industry. Now, whatever results are forthcoming will be of official nature.

Earlier fears that the imminence of the hearings might tend to slow the introduction and use of newer compounds which might have a residue problem, are now somewhat dispelled. Several new materials are known to be under test in demonstrational field use at the present time, and since it is clearly understood that these materials will have to be well proven before being offered commercially, this fact is regarded as a distinct advantage of the hearings.

News that the hearings would be held, was welcomed by the insecticide industry generally. However, some confusion seems to exist over what is the real purpose of the hearings, and what they hope to achieve. In this respect, the National Agricultural Chemicals Association deserves much credit for the constructive and cooperative program upon which it has embarked in connection with educating the industry and allied groups. The Association has taken what is believed to be a most constructive attitude and has given its position widespread and clearly stated publicity.

The National Agricultural Chemicals Association, recognizes that the purpose of the contemplated hearings is to safeguard the public health through the protection of the food supply against the improper use of agricultural chemicals necessary for the production of foodstuffs. The N.A.C. points out that the establishment of proper tolerances is primarily a matter between the growers who use these chemicals and the Food and Drug Administration which is responsible for the safety of the food supply. Another tenet of the Association's policy is complete cooperation with all interested groups which take part in the hearings. It has offered its services in coordinating the presentations of these groups, in order to aid in securing "a sound and impartial presentation of evidence."

A special committee has been formed by the N.A.C. Association to aid in this coordination. Lea S. Hitchner, N.A.C. executive secretary has appeared before various gatherings to outline policies and to solicit the aid of various interested groups. The Association has solicited the support of the Land Grant Colleges and leading agricultural grower organizations in advising them of the type of evidence which should be presented and aiding them in every other possible way.

In all of its efforts, the Association has offered a plan which should be followed to determine these tolerances. Objectives of the suggestions are to aid in the arrival at a program which will accomplish the following:

a) **"Determination as to whether a residue problem exists from use of a given chemical.**
b) **If a residue problem exists, what is the maximum tolerance permissible.**
c) **No curtailment in making available to grower a wide range of products from which he can make a selection.**
d) **Continued research and development on new products and new uses for established products."**

The entire industry, through its spokesman, the Association, knows that it has a big and as yet undefined problem, since the establishment of residues on chemical pesticide products is a somewhat new procedure. However, through the realization of the necessity for presenting factual information and obtaining a better understanding of the problem among the various interested groups, the industry looks forward to a safer, more effective and greatly expanded pest control program.

The first practical evaluation

(*Turn to Page 66*)

As this report is written, it appears that the resolution introduced in the House Rules Committee to investigate the effect on the nation's health of insecticides, weed killers, fertilizers and other chemicals used directly in foods will not be considered at least until the 2nd session of the 81st Congress. Originally introduced by Representative Frank Keefe (Rep., Wisc.) in the spring of 1949, it was reintroduced by Representative Adolph Sabath (Dem., Ill.) but since has languished in the House Rules Committee. This is one less problem that is faced by the industry —at least until 1950!

For **Basic Agricultural Chemicals of Quality**

KOLKER

DDT

100% Technical grade

Wettable and dust concentrates

25% Emulsifiable solution

30% Emulsifiable solution

40% Emulsifiable solution

2,4-D

Acid

Sodium salt

Triethanolamine salt

Methyl ester

Butyl ester

Isopropyl ester

40% Butyl ester sol.

44% Isopropyl ester sol.

Strict laboratory control . . . on-the-dot shipments . . . friendly, expert technical service . . . these are just a few of the reasons why *"It's a pleasure to do business with Kolker."*

Call or write today for samples and prices

Kolker Chemical Works Inc.

80 LISTER AVENUE • NEWARK 5, N. J.

Manufacturers of Organic Chemicals

The Listening Post

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Dr. Haeussler is in charge of Insect Pest Survey and Information, Agric. Research Adm., B. E. & P. Q., U.S.D.A. His observations are based on latest reports from collaborators in the department's country-wide pest surveys.

By G. J. Haeussler

THE velvetbean caterpillar was infesting soybeans in moderate numbers in the Charleston district of South Carolina about the middle of September. It caused moderate damage to soybeans and noticeable injury to kudzu in the vicinity of Experiment, Georgia. Light infestations were present on velvetbeans in Gadsden County, Florida, and an infestation on peanuts in Jackson County was on the decline by the middle of the month.

The fall armyworm caused some damage to late corn in Maryland, Georgia, and Mississippi, and was reported attacking various crops in New Jersey, Virginia, South Carolina, and southern Louisiana.

The corn earworm severely damaged sweet corn that came into silk after the middle of August in the canning districts of central Illinois. Corn grown for the market during late summer in south central Illinois, southern Indiana, and Missouri was also very heavily infested. Late corn and grain sorghums in Texas suffered damage late in September, and heavy infestations of this insect in corn were also reported from Maryland, Ohio, and southern Idaho. A severe infestation of the corn earworm was reported in sweet peppers in Dorchester County, Maryland during the month.

Heavy infestations of the sorghum webworm occurred in Dallas County, Texas in early September, and an outbreak of the pest was reported on grain sorghums in southwestern Missouri during the last half of the month.

Codling moth injury to apples late in the season was generally not severe. However, reports indicated that the number of orchards heavily infested in the Hudson Valley area of New York was greater this year than in any year since 1946 and that injuries were somewhat more numerous than last year in the Wooster, Ohio area. Some late infestations were reported from Missouri in orchards that did not receive a thorough spray program.

Infestations of the pear psylla were heavy during September in poorly protected orchards in the Hudson Valley of New York. Growers, however, in general apparently did a better job than usual in controlling the insect in that area. A heavy infestation of the pear psylla was reported from Mosier, in Wasco County, Oregon, and light infestations around Milton, in Umatilla County.

Bean Beetles Numerous

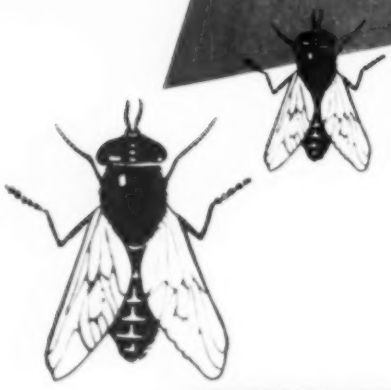
MEXICAN bean beetle populations continued heavy during the first part of September in the Atlantic and Gulf Coast regions. Infestations were generally diminishing in intensity toward the end of the month, especially in the northern areas. The lesser cornstalk borer was reported attacking beans during the month on the eastern shore of Virginia and in the Charleston district of South Carolina. Moderate to heavy infestations of the green cloverworm occurred on beans in New Jersey, Maryland, and Virginia, and the insect was reported attacking soybeans at several places in North Carolina. The corn earworm was reported attacking beans in moderate to heavy numbers during the month along the Atlantic Coast from New York to Florida. It was also causing considerable injury to lima beans in Ventura County, California toward the end of the month. The bean leaf roller was prevalent on beans in Virginia, South Carolina, Georgia, and Florida. The bean leaf beetle was numerous in Mississippi early in September, and toward the end of the month was abundant on beans in Louisiana and infesting that crop in Virginia. Infestations of the two-spotted spider mite on beans were reported from New Jersey, Virginia, and southern California.

Cabbage caterpillar infestations were generally moderate to heavy on cabbage and related crops in all areas from which reports were received during the month. Aphids were destructively abundant on cole crops during the first half of September in parts of New York, New Jersey, South Carolina, Idaho, and California, with lighter populations reported from Wisconsin. Toward the end of the month they occurred in moderate to heavy numbers on crucifers in parts of Virginia, South Carolina, Utah, and California, with lighter numbers reported on these crops in Florida. Several hundred acres of cabbage in Smyth County of southwestern Virginia were seriously infested by the cabbage aphid at the close of the month.

Other Pests in South

DURING the early part of September the tomato fruitworm was abundant on tomatoes in South Carolina, Mississippi, Utah, and Colorado. Moderate to heavy infestations were reported from New Jersey during most of the month, and from Utah and California late in the month. The tomato hornworm was numerous in New York early in the month, and present in moderate numbers in South Carolina and Florida. Hornworms were numerous on tomato in New Jersey and South Carolina during mid-September, and the larvae were infesting tomato and

Safe, Effective Dairy Insect Control



Dairy sprays based on U.S.I. *Pyrenones** provide safe control of the dairy insects *that are toughest to kill* – not just horn flies, but stable flies, tabanids, and deer flies as well. And Pyrenones are recognized as non-hazardous. Properly formulated sprays based on Pyrenones are equally safe.

Pyrenone-type sprays are versatile, too. Dairymen can use them in milk rooms – and in other parts of the dairy, farm, or ranch buildings – to kill roaches, cheese mites, ants, silverfish, and a wide variety of other insects.

Pyrenone-type sprays offer the dairyman maximum dairy insect control at reasonable cost – and provide insecticide manufacturers and distributors with attractive profits. Your nearest U.S.I. office will gladly furnish further details about Pyrenones.

*Pyrenone is a registered trade-mark of U.S.I. It designates combinations of pyrethrins and piperonyl butoxide.

U.S.I. INDUSTRIAL CHEMICALS, INC.
60 East 42nd Street, New York 17, N. Y.
Branches in all principal cities
In Canada: Standard Chemical Co., Ltd., 99 Vanderhoof Avenue, Leaside, Toronto 17, Ontario.

eggplant in Florida at the end of the month. Aphid infestations were severe on tomato in New Jersey and parts of South Carolina toward the end of the month. Blister beetles also caused some damage to tomatoes in South Carolina and Mississippi.

A heavy infestation of the European corn borer in peppers was reported from the Toledo district of Ohio, from 15 to 20 percent of the crop in several fields being damaged. Aphids caused some damage to peppers in New Jersey and California during the early part of the month.

The infestation of the potato psyllid in Colorado, Nebraska, and Wyoming continued through September, but appeared to be diminishing toward the end of the month in the latter two states. Severe damage was being caused to late-planted potatoes and tomatoes in the area.

The potato tuberworm caused serious damage to potatoes on the Eastern Shore of Maryland and light damage in the Norfolk district of Virginia.

Infestations of aphids persisted into early September on remaining tobacco in northwestern Tennessee, but decreased rapidly to the point where they were no longer present in destructive numbers. A widely distributed but light infestation of aphids on tobacco was reported in Dane County, Wisconsin early in the month. Flea beetles were unusually abundant on tobacco during the first two weeks of September in northwestern Tennessee and hornworm eggs were also numerous on that crop in that section. In Florida, moderate numbers of hornworms persisted into early September on remaining tobacco and tobacco crop remnants.

1949 Report on Cooperative tests of SEED TREATMENTS on GRAINS

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Survey Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture, Beltsville, Md.

By Paul R. Miller

COOPERATIVE field experiments with seed treatments on spring grains were conducted in the spring and summer of 1949 by plant pathologists at experiment stations at Lafayette, Indiana; Urbana, Illinois; Ames, Iowa; Madison, Wisconsin; St. Paul, Minnesota; Brookings, South Dakota; Fargo, North Dakota; Bozeman, Montana; Pullman, Washington; and Aberdeen, Idaho; and at the plant Industry Station at Beltsville, Md. The results have been summarized by R. W. Leukel of the U. S. Bureau of Plant Industry, Soils, and Agricultural Engineering.

Fungicides used in the tests included the mercurials "New Improved Ceresan" (5% ethyl mercury phosphate), "Ceresan M" (7.7% ethyl mercury p-toluene sulfonanilide), "Ceresan M" slurry, and "Panogen" (2.1% methyl mercury dicyan diamide); and the non-mercurials "Phygon XL" (50% dichloro naphtho quinone), "Arasan" (50% tetramethyl thiuram disulfide) "Spergon" (98% tetrachloro benzoquinone), "Seedox" (50% trichloro phenol acetate), and "Dow 9-B" (50% trichloro phenate). Rates of application were as listed in Table I.

Five lots of seed were used, including two of barley, two of oats, and one of wheat. One lot of barley, Odessa variety, was heavily infected with covered smut (caused by the fungus *Ustilago hordei*). The other was of a mixture of varieties infected with stripe (*Helminthosporium gramineum*). This stripe-infected barley was planted only at five stations, viz., Beltsville, Lafayette, Urbana, Madison, and Fargo. The oat seed lots used included the Canadiarf variety heavily, and the Wayne variety lightly, infected with the loose and covered smuts (*Ustilago avenae* and *Ustilago kolleri*, respectively). The wheat was of the Ulka variety, which is very susceptible to bunt (*Tilletia* spp.), inoculated with mixtures of bunt spores.

The different seed lots were cleaned and separate portions of each lot were treated with the different fungicides. The treatments were applied in metal cans of 1000 cc capacity fitted with dust-tight covers. The cans were first "conditioned," with specific fungicides, by "excess treating" a 500 cc sample of sorghum seed in each. Thereafter the same can was used for treating all samples of seed with a given fungicide. Samples of 500 cc (1/70 of a bushel by volume) were placed in each can, the proper amount of fungicide was added, and the cans were then slowly tumbled in a mechanical device for 15 minutes. The slurry and liquid treatments were measured with a pipette and the material distributed over the surface of the seed, after which the can was immediately given a preliminary shaking by hand.

The Ulka wheat and Odessa barley were treated on March 3, the two lots of oats on March 8, and the stripe-infected barley on March 18. The treated seed was kept in open containers until it was packeted and distributed for planting. The seed was packeted at Beltsville for sowing in triplicated rod rows at each of the eleven stations. In packing the seeds for shipping, care was taken to keep the different treated lots from affecting each other or the untreated checks. Each lot was wrapped in wax paper, and the seed lots treated with volatile dusts were sent in a separate parcel.

Germination tests in soil were made at Beltsville in March, testing each combination of seed and fungicide, including untreated seed. Germination tests with Purplestraw wheat earlier in the winter were reported with the results of the March test.

V-C PRODUCTS

V-C FERTILIZERS

Complete Fertilizers
Superphosphate
Concentrated Superphosphate
Phospho Plaster
Sulphuric Acid

V-C CHEMICALS

Phosphorus
Phosphoric Acids
- Technical Grade
- 85% N.F. Grade
- 75% Food Grade
- 62½% Commercial Grade

Sodium Phosphates
- Disodium Phosphate (Technical and Drug Grades)
- Trisodium Phosphate
- Tetrasodium Pyrophosphate
- Sodium Tripolyphosphate

Calcium Phosphates
- Monocalcium Phosphate
- Lucky Leaven® Phosphate
- Phosphate Paste

V-C PHOSPHATE ROCK PRODUCTS

Phosphate Rock, Ground and Unground
Calcined Phosphate Rock
Nodulized Phosphatic Materials

V-C BAGS

Burlap Bags
Cotton Bags
Paper Bags

V-C CLEANSERS

The Vicar® Line of Cleansers

V-C FIBERS

Vicara® Textile Fibers
Zycon Fibers

VIRGINIA-CAROLINA CHEMICAL CORPORATION
General Offices:
401 East Main Street, Richmond, Virginia

"Black Leaf"® PESTICIDES

Black Leaf 40—for spraying fruits, vegetables, and flowers to control aphids and similar sucking insects. Also used to control certain external parasites of cattle, sheep, and poultry—and as a drench for sheep.

Black Leaf Dry Concentrate—a dry powdered nicotine compound that combines the versatility of Black Leaf 40 with the convenience of a dry product.

Black Leaf 155—a "fixed" nicotine compound for spraying apples and pears to control codling moth, also for controlling grape berry moth and citrus thrips.

Black Leaf 10 Dust Base—a "free" nicotine compound, easy to mix with non-alkaline carriers to make a neutral dust.

Black Leaf Garden Dust—a multi-purpose dust or spray containing nicotine, pyrethrum and rotenone—*plus* a concentrated fungicide.

Black Leaf Rotenone Dust—1% rotenone and sulphur, blended on our special carrier material.

Black Leaf Mash-Nic—for controlling the large roundworm (Ascaridia galli) in chickens. A "single-shot" treatment.

Nico-Fume Liquid—contains 40% actual nicotine in a "free" form—for greenhouse spraying and fumigating to control aphids and similar sucking insects.

Nico-Fume Pressure-Fumigator—spreads penetrating nicotine fumes under pressure to control aphids and similar sucking insects in the greenhouse.

Benzo-Fume Pressure-Fumigator—for the control of greenhouse red spider mites.

TOBACCO BY-PRODUCTS & CHEMICAL CORPORATION
Richmond, Va. • San Francisco, Calif.

In this variety, "Phygon" and "Ceresan M" slurry seemed to cause significant increases in number of seedlings emerging (13 and 12 percent increase respectively). "Seedox" and "Dow 9-B" significantly decreased the percentage of emergence in Ulka wheat ("Seedox" 14 percent decrease, "Dow 9-B" 10 percent), and in Wayne oats (18 percent and 11 percent, respectively). No other significant differences between germination of treated and untreated seed were apparent.

A second germination test made 6 months later (September 1949) was confined to the untreated portions of Ulka wheat, Odessa barley, and Canadian oats, along with those portions treated with mercurials. Included also were samples of Victorgrain winter oats similarly treated in September 1948, except that "Panogen" had been applied at 2 ounces instead of 1½ ounce per bushel. In this test, the seedlings from the treated seed were more vigorous than those from untreated seed, and the percentages of emergence were higher except in the one case of Victorgrain oats treated with "Panogen" at 2 ounces per bushel. When the soil was removed from the layer of germinated seeds in each pan, no indications of mercury injury could be found. (The relative degree of disease control obtained by the different fungicides is summarized in Table I.

Probably the most striking feature of these results is the range in the percentages of infection in the untreated checks at the different stations. Smut infection in Canadian oats, which had reached 48 percent under optimum greenhouse conditions, ranged in the field from 9 percent at Beltsville to 45.7 percent at St. Paul. Infection in Odessa barley, which had been 77 percent in the greenhouse, ranged from 5 percent at Madison to 20 percent at Pullman. The percentage of bunt in Ulka wheat (not tested in the greenhouse) ranged from 0.9 percent at Ames to 57.6 percent at Pullman. The percentage of barley stripe-disease ranged from 7.8 percent at Fargo to 14.6 percent at Urbana.

TABLE I

Relative effectiveness of different fungicides in the control of certain seedborne diseases of small grains.

TREATMENT oz. : bu.	PERCENT INFECTION Average and range for eleven stations (*five stations)				
	OAT SMUTS		BARLEY SMUT	BARLEY STRIPE	WHEAT BUNT
	Canadian	Wayne	Odessa	Mixture*	Ulka
Untreated check	29.7	6.7	9.7	11.3	14.3
	9-45.7	2.9-12.8	3-20	7.8-14.6	0.9-57.6
"New Improved Ceresan" ½	Trace	Trace	Trace	0	0
	0-0.1	0-0.1	0-0.2		
"Ceresan M": ½	0	0	0	0	0
"Ceresan M" slurry: ½	0	Trace	0	0	0
		0-0.2			
"Panogen": ½	3.5	1.1	0.4	—	—
	1.2-8.1	0-2	0-0.8		
1	—	—	—	—	0
1½	Trace	0.1	0	0.2	—
	0-0.2	0-0.8		0-0.7	
"Phygon": 1	6.8	1.3	0	3.1	0.6
	5.1-13.4	0.7-1.9		1.3-5	0-5.5
"Arasan": 1	8.2	1.6	0		0.1
	1.6-19.9	0.3-3.0			0-0.9
"Spergon": 2	—	—	—	—	0.2
					0-1.1
"Seedox": 2	7.8	1.5	3.0	2.4	—
	4.5-12.1	0.6-2.3	0.7-8.4	0-12.8	
"Dow 9-B": 2	10.8	2.0	1.9		1.9
	5.7-20.7	0.9-2.6	0.8-3.6		0-8.7

There also was a considerable range in the percentage of infection following the less effective treatments. To some extent this range in infection paralled that from untreated seed, but there were many striking exceptions. For example, at Ames and Madison, bunt infection in Ulka wheat was 0.9 and 1.6 percent respectively in the checks, and no infection was found on any of the rows from treated seed. At Pullman, with 57.6 percent in the checks, infection from three lots of treated seed was several times greater than at other stations, but bunt was apparently controlled by "Arasan" and "Spergon," although these two materials did not eliminate it at several other stations where infection in the checks was much lighter. The necessity of evaluating fungicides on the basis of results obtained at a number of locations was evident.

With a few exceptions, "New Improved Ceresan," "Ceresan M," "Panogen" (at 1½ ounces per bushel), and "Ceresan M" slurry controlled the diseases under observation in the different seed lots at all the stations. An occasional smutted plant in these rows may possibly have been due to a stray kernel from an adjacent row. "Panogen" at ¾ ounce per bushel was unsatisfactory. "Phygon XL" and "Arasan" were relatively ineffective in the control of the oat smuts, while apparently effective in eliminating covered smut in barley and, with few exceptions, bunt in wheat. "Seedox" and "Dow9-B" were unsatisfactory in these tests. "Spergon," with one exception, was fairly effective in reducing the infection by bunt to less than 1 percent.

"Panogen," a relatively new fungicide, appears to be satisfactory for controlling certain diseases without indication of seed injury when properly applied to seed of wheat at one fluid ounce per bushel or to barley and oats at 1½ fluid ounces per bushel. The chief impediments to its more general use at present seem to be a lack of data on the effect of different rates of application and periods of prolonged storage on germination, stand, and disease control. There seems to be a need, also, for an efficient, inexpensive machine for applying it evenly and rapidly to the seed.

Non-mercurial organic compounds such as "Phygon," "Arasan," and "Spergon" are not recommended for treating seed of small grains. Their failure to control the seed-borne diseases of certain cereals consistently and satisfactorily has been amply demonstrated. During the late war when mercury was needed for military

(*Turn to Page 67*)

Technical Briefs

Report on Cinerin I Homolog Tests

THE successful synthesis of esters closely analagous to cinerin I, announced early this year by Schechter, Green and La Forge of the U.S.D.A., has been followed promptly by commercial production of this possible synthetic replacement for natural pyrethrum. Commercial production on a scale large enough and at a cost low enough to make the compound available for experimental purposes has recently been announced by U. S. Industrial Chemicals, Inc., New York.

Preliminary test results, however, have indicated that the synthetic product is less effective than the natural active principles of pyrethrum flowers. Comparative tests are reported against truck crop insects, the tests being made by a modification of the settling tower method in the laboratory on adults of the Japanese beetle, the Colorado potato beetle, the spotted cucumber beetle, the striped cucumber beetle, the Harlequin bug, adults and larvae of the Mexican bean beetle, adults and nymphs of the squash bug, nymphs of the melon aphid, and larvae of the corn earworm. Dusts containing the natural pyrethrum product produced mortality within a range of 50 to 95 percent concentration. Comparable concentrations and dosages of dusts containing the synthetic allyl homolog of cinerin I were in all cases less effective against all species than the natural product. The relative effectiveness of the two materials varied markedly with the species of insect used. The synthetic product also appears to offer more of a toxicity hazard to warm blooded animals than does natural pyrethrum.

The following general conclusions were drawn by the authors from this preliminary test work:

(1) The new chemical cannot be spoken of or thought of as "synthetic pyrethrum." Any assumption that it can be substituted for natural pyrethrum in existing insecticide formulations, is unfounded.

(2) Careful, thorough, entomological investigations of the behavior of the new synthetic compound against specific insects and under the recommended conditions of use must be undertaken to develop uses in insecticide formulations and to permit due allowances in such formulations to take advantage of the peculiar properties of the compound.

(3) There can be no assumption that the chemical is toxicologically as safe as natural pyrethrum until the matter has been studied with due allowance for the impurities which may be present in the commercially prepared material.

(4) Despite the fact that more complete entomological study has disclosed facts which are, to some degree, disappointing and disillusioning as compared with the expectations aroused by the earlier announcements, it is apparent that the completely synthetic allyl compound has a high degree of effectiveness against many species of insects and fully warrants further investigations which are required as a precedent to its effective utilization.

— R. B. Stoddard and W. E. Dove in *Soap and Sanitary Chemicals*, October, 1949.

•

2, 4-D Tested in South

After three years of experiments with 2, 4-D for control of wild onion and wild garlic, the Mississippi Agricultural Experiment Station, State College, Miss., reported, in July that this herbicide has limited value for this purpose.

The sodium salt form of 2,4-D gave no control and even the addition of wetting agents did not appreciably improve the effect of the sodium salt. The amine form of 2, 4-D produced variable results, apparently associated with either stage or vigor of growth. December applications were favorable, but winter and spring applications were not. Ester formations of 2,4-D were most dependable, especially when plants were growing vigorously. However, the ester had one liability, the report states, in that it evaporates and surrounding vegetation sensitive to 2,4-D may be injured.

Best time and sequence of application was not fully determined, but results at different seasons and under differing conditions are outlined in the report. Whether several light applications would be superior to a few heavy applications was also not settled. Wild onions are not controlled rapidly by 2,4-D and the report cautions that a series of applications over two seasons are likely to be necessary.

For control of crawfish, which infest northeastern prairie sections of Mississippi and eat the cotton seeds at planting time, the Mississippi station recommends one pound 50 percent wettable DDT, stirred into about 1½ gallons of water and applied to 1½ bushels of cottonseed, for broadcasting over the area.

A new imported pest, the fire ant, which first appeared in Mississippi in 1948, has extended its range this past year, the Mississippi midyear report states. Chlordane is recommended to be blown into tunnels and galleries of the nests.

The station authorities turned thumbs down on a mechanical bug catcher after tests which showed that the machine "apparently had little or no effect on the number of cotton flea hoppers, tarnished plant bugs, ladybeetles and other insects." "As it was apparently of no value," states the report, "the machine is not recommended."

•

Fungicide Experiments

At the Tennessee Agricultural Experiment Station, Knoxville, Tenn., a dusting and spraying program was conducted with Irish potatoes, with three objectives: to re-evaluate spraying versus dusting; to determine the effects of new insecticides and fungicides; and to test plant stimulation to DDT.

Spraying, it was found, gave 34 more bushels per acre than dusting, and fungicides in the dust gave no increased yield over dust containing no fungicides. In comparing yields of untreated plots with plots dusted and sprayed, it appeared that DDT increased the yield 82 bushels per acre and the fungicide 34 bushels, a total of 116 bushels, due to their combined use.

Yield data showed that nine new fungicides are better than bordeaux, although "Dithane" and "Yellow Cuprocide" gave yields not significantly different. Chlorinated camphene, after the second spray, was found to be causing foliage injury, but this was confined largely to row ends, where the sprayer was slowed for turning. The sprays were continued and yield was not affected. Late blight was ruled out as a factor in the tests and the increased yields, it was decided, were from early blight control. Use of the fungicides "Phygon," "Zerlate" and copper oxychloride sulfate on some plots seemed to be of little value, the report states.

Large Gains Seen in 1947 Ag. Chem. Census Report

VAST increases in the value of agricultural chemicals shipped in the U. S. are noted in the totals presented in the recently-issued *Census of Manufactures: 1947*, published by the Bureau of the Census of the U. S. Department of Commerce. The tabulation compares the value of products shipped in 1947 with 1939 figures. The 1947 census is the first issued since the war, and 1939 was the last pre-war year for which census figures are available. (See Page 22 for a further discussion of the 1947 report. Tables from the report will appear in our December issue.)

A total of $85,824,000 is reached for 1947 by including agricultural insecticides, fungicides and weed killers, (based on f.o.b. plant) A similar total for 1939 is not available, since many of the items were not even known at that time, and of course could not be computed. But in cases where a comparison is drawn, the figure for 1947 usually indicates great expansion.

In the sulfur-containing preparations, for instance, wettable sulfur dust shipments totaled $3,256,000 in 1947 compared to $999,000 in '39. Lime sulfur (solution and dry) was $1,641,000 against $925,000; while "other sulfur-containing insecticides and fungicides" totaled $3,113,000 for 1947. (No 1939 figures were available) The same situation was true for copper-containing dry preparations which amounted to $3,609,000 in 1947; and zinc-containing preparations, $711,000 in 1947.

Sodium aluminum fluoride dusts and mixtures were valued at $767,000 in '47, compared to $442,000 in '39; and other fluorine-containing insecticides and fungicides were valued at $99,000 in '47, with no comparable figure for 1939. Nicotine-containing preparations (including dusts, excluding nicotine sulfate) were valued at $1,700,000 in '47; and nitrated phenols and cresols (except weed killers) totaled $531,000 in '47.

Rotenone dusts totaled $4,141,000 in '47, against $567,000 in '39; and sprays, (except fly sprays) totaled $450,000 in '47. Pyrethrin containing insecticides and fungicides marked one of the few declines in value for 1947, totaling only $443,000 against $1,223,000 in 1939. Pyrethrin-containing sprays (except fly sprays) totaled $923,000 in '47.

Benzene hexachloride preparations without DDT were valued at $3,319,000 in 1947, without comparable figures for the earlier period. DDT-containing preparations except aerosols and fly sprays, were listed as follows: products containing DDT as the active ingredient, $16,141,000 in '47; and preparations of DDT and other toxicants, $3,096,000.

Petroleum oil sprays (not including fly sprays and aerosols) were classified as "oil sprays and emulsions without other toxicants," which were valued at $5,488,000 in '47, without comparable 1939 totals. "Oil sprays containing other toxicants" totaled $515,000 in '47; while "other insecticides and fungicides for agricultural use" (including nicotine sulfate and organic fungicides) totaled $16,584,000 in '47, against $9,814,000 in '39. Insecticides and fungicides not specified by kind, were valued at $6,058,000 for 1947.

Lead arsenate and calcium arsenate showed slight drops from the 1939 level, according to the census. The former was valued at $2,085,000 in 1947, and $5,422,000 in 1939; while the latter remained about the same, the figures being $1,900,000 and $1,912,000, respectively. Other arsenical insecticides and fungicides (including Paris Green) showed a big increase: $1,334,000 for 1947 against $460,000 for Paris green only, in 1939.

No 1939 figures were available for weed killers, but according to the census, the total value of herbicides shipped in 1947 was $7,924,000, with 2, 4-D contributing the greatest amount of any single preparation: $3,667,000. Arsenical weed killers amounted to $1,364,000; sodium chlorate, $1,087,000; other weed killers, (hydrocarbon, etc.), $1,587,000; and others, not specified by kind, $219,000.

The *Census of Manufactures: 1947*, designated as MC28H, is available from the Superintendent of Documents, U. S. Govt. Printing Office, Washington 25, D. C. Price is fifteen cents.

•

Utah Tests Fertilizers

The Utah Growers Cooperative, American Forks, Utah, has teamed up with specialists from the Utah agricultural college and experiment station for a series of tests involving use of fertilizers and insecticides suitable for celery production. Use of three rates of nitrogen fertilizers is being followed in one test to determine the optimum fertilizer combination and level for best celery yield and quality. Another project will determine if potash can be used to improve either yield or quality and a third is concerned with soil amendments. Sprays for insect and disease control are being tested for the most desirable under conditions prevailing in this large celery producing area.

FIRST AGAIN in pest control!

ORTHO
SCIENTIFIC PEST CONTROL

...the first name in Scientific Pest Control

Here is the year's BIGGEST news in FLY CONTROL...

LINDANE JUST APPROVED BY FEDERAL AUTHORITIES.

...and ISOTOX Dairy Spray containing LINDANE is available right now!

Here are the facts on ISOTOX Dairy Spray containing APPROVED LINDANE, the potent new insecticide with a 3-way residual killing power!

ISOTOX DAIRY SPRAY KILLS FLIES. New ISOTOX Dairy Spray, containing approved lindane, is the fastest fly control. It kills flies resistant to DDT and Methoxychlor. It kills flies immediately — they don't spin around half dead for hours. It kills flies by direct contact and by residual action for about 4 weeks, depending on the weather.

ACTUAL USAGE SUCCESSFUL. Dairymen for the past year — and experiment stations in New York, New Jersey, Texas, California, in addition to other areas — have been using ISOTOX. They report outstanding success in killing flies. Dairy pest control operator A. S. Lasley, Bellflower, Calif., says:

ISOTOX Dairy Spray will clean up a dairy quicker than anything I've ever used. DDT at its best used to take 6 to 12 hours to kill a fly. ISOTOX Dairy Spray drops them right on the floor! And I have found that a regular program of spraying with ISOTOX Dairy Spray will put the dairyman money ahead, because he gets a good cleanup of flies

ISOTOX DAIRY SPRAY containing lindane is a wettable powder. It is used at the rate of 10 pounds to 100 gallons of water. It is packed conveniently in 1-pound and 4-pound cans and 20-pound pails.

OTHER USAGES. ISOTOX Dairy Spray, containing lindane, is an excellent residual spray in buildings where dairy products are handled. Also ISOTOX Dairy Spray not only controls flies in and around dairy barns, farm buildings, manure piles and other fly-breeding places, but it may be used to control certain pests on livestock, such as ticks and lice on beef cattle, sheep ticks on sheep; lice on beef cattle, hogs, horses and sheep; scab or sarcoptic mange on dairy cattle, beef cattle, sheep and hogs. It also controls roaches, ants, mosquitoes and certain other insects.

ISOTOX Dairy Spray mixes readily with water for spraying. It can also be used as a paint around windows, doors, walls and ceiling beams — wherever flies gather. Directions for uses are printed on the label.

Phone your dealer or contact our offices listed below for immediate shipment. ISOTOX Dairy Spray will save you money through better pest control resulting in higher milk production.

CALIFORNIA SPRAY-CHEMICAL CORP.

Head Office: Richmond, California

Pacific Northwest . . 815 E. Yamhill St., Portland, Oregon
Northern California . . 515 N. 10th St., Sacramento, California
Central California . . 675 Emory St., San Jose, California
San Joaquin Valley . . 3208 Hamilton St., Fresno, California
Southern California . . 202 No. Magnolia St., Whittier, California
Rocky Mountain . . P. O. Box 428, Caldwell, Idaho

Middle West . . . . . 705 Walnut St., Kansas City, Missouri
Southwest . . . . . 610 Leonhardt Bldg., Oklahoma City, Okla.
Great Lakes . . . . . P. O. Box 71, South Haven, Michigan
Northeast Atlantic . . . 150 Bayway Ave., Elizabeth, New Jersey
Western New York . . . 147 Railroad Ave., Lyndonville, New York
Southeast Atlantic . . P. O. Box 1231, Orlando, Florida

Suppliers' Bulletins

Nozzle Line Described

A 12 page bulletin has been issued by Monarch Mfg. Works, Inc., Philadelphia, describing the firm's complete line of nozzles for all types of agricultural sprayers. Detailed drawings of flat spray nozzles, cone spray nozzles, and various valves used in the nozzles are presented, as well as application charts and nozzle capacities. The latter charts are given in terms of spacing, height (in the case of airplanes) and gallons per hour. The company's line of pressure regulating valves is also described as are several types of swivel adapters. The booklet, printed in two colors, is available from Monarch Mfg. Works, Inc., 3406 Miller St., Philadelphia 34, Pa.

•

Dust Goggle Bulletins

Goggle Parts Co., Cleveland, Ohio, has announced a new product, "Flex-a-Foam" filter masks for protection against non-toxic dusts. The mask is said to be a considerable advancement in industrial dust protection from the standpoint of comfort and utility. The new product weighs but one ounce, and consists of only four interlocking parts. The filter is a honeycomb construction of whipped latex ventilated so as to admit air but to keep out dusts as small as 1/25,000 of an inch. Literature is available from the company, 1468 W. 9th St., Cleveland 13, Ohio.

•

Warning Manual Revised

A revised edition of "Warning Labels" has been issued by the Manufacturing Chemists Association, Washington, D. C. according to M. F. Crass, Jr., secretary of the MCA. The manual, first published in 1945, is intended as a guide for the preparation of warning labels for hazardous chemicals.

Mr. Crass pointed out that the book is also intended "to facilitate an effective, uniform pattern of chemical labeling throughout the nation and to protect the ultimate consumer in the handling and use of chemicals." The manual has served as a basis for labeling laws in a number of states and territories.

The booklet presents general principles involved in the design and preparation of warning labels for hazardous chemicals, including 58 illustrative warning labels for economic poisons.

•

Elevator & Dumper Shown

Colson Equipment & Supply Co., 1317 Willow St., Los Angeles,

has issued a new eight-page booklet illustrating and describing the firm's "Cesco Dumper" for lifting, up-ending and dumping bags, boxes, barrels and drums. The booklet pictures applications of the equipment as used in industry, and describes varieties and sizes which are available.

•

Spray Machine Bulletin

Cooley Spray Equipment Works, Somers, Conn., have published a new folder describing their "Cooley-Mist" portable concentrate sprayers used for spraying trees, shrubs, gardens and nurseries. The folder features two models . . . a wheelbarrow type and another mounted on a skid. Full information is given on specifications and uses, with a number of illustrations. Copies may be obtained from the company.

•

Announces Weed Killer

Chipman Chemical Co., Inc., Bound Brook, N. J., has introduced a new non-selective weed killer, "Chlorax Spray Powder," which controls practically all weeds and grasses, the company states. The new product contains sodium chlorate (combined with a special form of borate) but does not constitute a fire hazard. The makers state that the product does not create danger of poisoning to grazing livestock under normal conditions of use. Descriptive information is available from the company.

•

Monsanto Food Booklet

Monsanto Chemical Co., St. Louis, Mo., has recently issued a booklet describing the contributions of chemistry to the production, processing, packaging and merchandising of food. The part played by pesticides is covered, both in the production of foods and in their protection in storage. Herbicides are given a considerable amount of attention in the booklet. It is available upon request.

•

"Iscobrome" is Described

The Insecticide Division of Innis, Speiden & Co., New York, has issued a new leaflet describing the firm's product, "Iscobrome," soil fumigant. Instructions on the use of the material are given as well as descriptions of application equipment for areas both large and small. The correct amounts to use for best results are also given in the booklet. It is available from the company, 117 Liberty Street, New York City, N.Y.

•

New Sharples Bulletin

Operating details, specifications and application data for the complete line of Sharples "Super-Centrifuges" have been published in a new bulletin, No. 1248, by the firm. Basic information on the centrifuge principle, its best utilization, operating features and specifications on all forms and models are given in the bulletin, available from Sharples Corp., 2309 Westmoreland St., Philadelphia 40, Pa.

IMPROVE THE EFFICIENCY OF YOUR INSECTICIDES AND FUNGICIDES WITH...

TRADE VATSOL MARK

WETTING AGENTS

Each different type of VATSOL Wetting Agent has been developed for a specific purpose in insecticides and fungicides. You will improve the efficiency of your products by investigating the VATSOLS and using the type which best meets your particular needs.

VATSOL K Powder

A dry powdered wetting agent, containing 33% of VATSOL OT 100% in an inert filler. It is neutral in reaction and compatible with most of the common insecticides used in the form of wettable powders. Ready "flowability" recommends it for blending with dry insecticides or fungicides which are to be applied in the spray form. It may also be added to the spray tank containing any insecticide or fungicide. Because of its non-hygroscopic nature, VATSOL K can be readily repacked into small containers for local distribution.

VATSOL OT 100% Pellets

In pellet form this grade resembles paraffine, is somewhat soft and plastic and non-hygroscopic. Its solubility in petroleum and vegetable oils and absence of water makes this the preferred grade for oil sprays and other liquid concentrates where water is an undesirable component. Although not an emulsifying agent, VATSOL OT is a desirable additive material when used with an emulsifier in preparing a miscible, fast-breaking, mineral oil stock.

VATSOL OT 85% Paste

A heavy, viscous paste composed of 85% VATSOL OT 100% and 15% water. This is excellent for use in preparing miscible oils and fruit and vegetable washes.

VATSOL OT 70% Liquid

Contains 70% VATSOL OT 100% plus a neutral solvent and water. Because of its fluidity and ready solubility in organic solvents it is especially useful in concentrated liquid insecticides. This grade is not intended for use as a vegetable washing agent but is excellent for bulb dips.

VATSOL OT 25% Aqueous

Contains 25% VATSOL OT 100% and 75% water. This grade may be added directly to the spray tank or reduced to 10% strength and added to spray or wash solutions. Ideal for washing fruits and vegetables or for spraying with insecticides such as lead arsenate or nicotine sulfate.

Further information on use and cost will be promptly furnished upon request.

AMERICAN Cyanamid COMPANY

Agricultural Chemicals Division

32-D Rockefeller Plaza, New York 20, N. Y.

INDUSTRY NEWS

Bixby Named Sales Mgr.

Pennsylvania Salt Mfg. Co., has announced the appointment of Arthur F. Bixby as manager of sales, to succeed J. G. Brunton who re-

A. F. BIXBY

signed. Mr. Bixby joined Pennsalt in 1938. He is a graduate of the University of Massachusetts with a B.S. degree in agricultural economics. During the war he was with the Chemical Warfare Service of the U. S. Army, returning to Philadelphia in December, 1947. At that time he was assigned to the Agricultural Chemicals Division. A year later, he was appointed assistant manager of sales.

•

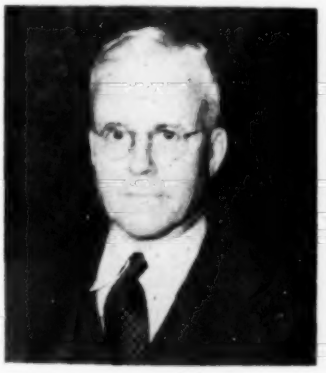
Ithaca Meeting Scheduled

The New York State Insecticide-Fungicide Conference was scheduled to be held November 14-16 at Ithaca, New York, as announced previously. In charge of the meeting plans were Drs. Charles E. Palm, and L. M. Massey, both of Cornell University. No advance program had been made available at press time, but it was understood that the papers to be presented would be of informal nature for the greater part. A full report of the meeting will be carried in our December issue.

•

Kephart Leaves Dept.

L. W. Kephart, senior agronomist, in charge of weed investigations for the Division of Cereal Crops and Diseases of the Bureau of Plant Industry, Soils and Agricultural Engineering, U.S.D.A., has announced his resignation from the Department, effective November 1. Mr. Kephart, who had been in Government service for the past 36 years, has taken the position of agriculturist with the International Bank for Reconstruction and Development, otherwise known as the World Bank. His new responsibilities will include ad-



L. W. KEPHART

vising the bank on matters pertaining to agriculture where foreign governments have applied for loans. The first such assignment will take Mr. Kephart to Siam to investigate a proposed new irrigation project for rice production. From there he will go to India for a few months to assist in the organization of a program to control Kans grass, for which loans have been made already.

•

Common Names Selected

Five common names have been coined by the Subcommittee on Fungicide Nomenclature of the American Phytopathological Society cooperating with the Interdepartmental Committee on Pest Control, to designate certain fungicidal materials. The announcement, made by Dr. S. A. Rohwer, Assistant Chief, Bureau of Entomology & Plant Quarantine, and chairman of the Interdepartmental Committee on Pest Control, said that notices of selection of common names and definitions had been forwarded to officials and agencies in other countries in addition to their being filed with the Trade-Mark Division

MEETINGS

National Fertilizer Association. Annual Fall Meeting. Atlanta Biltmore Hotel. Atlanta. Ga.. Nov. 14-16.

New York State Insecticide & Fungicide Conference. Ithaca. N. Y.. Nov. 14-16.

Western Canadian Weed Conference. Edmonton. Alberta. Nov. 15-17.

California Entomology Club. Berkeley. Calif.. Nov. 18.

Eastern Branch. A.A.E.E.. Lord Baltimore Hotel. Baltimore. Md.. November 21 & 22.

Aerial Spray Conference. Community House. Manhattan. Kansas. November 30. December 1 & 2.

Nat'l. Association of Insecticide & Disinfectant Mfgrs.. Mayflower Hotel. Washington. D. C.. Dec. 4-6.

North Central Weed Control Conference. Sioux Falls. S. D.. Dec. 6. 7. 8. 1949.

American Association of Economic Entomologists. 61st Annual Meeting. Tampa. Florida. December 13. 14. 15. 16. 1949.

Third Annual Cotton Insect Control Conference. Tutwiller Hotel. Birmingham. Ala.. December 19 & 20.

American Phytopathological Society. Martinique Hotel. New York. December 28. 29 & 30. (In conjunction with American Association for Advancement of Science.)

Northeastern States Weed Control Conference. Hotel New Yorker. New York. January 3-5. 1950.

Texas Entomological Society. Rice Hotel. Houston. Texas. January 19 & 20.

Southern Association of Science and Industry. Hotel Roosevelt. New Orleans. La.. January 23-24.

Western Weed Control Conference. Denver. Colorado. January 31 to February 2.

Association of Southern Agricultural Workers and Southern Weed Control Conference. Biloxi. Miss.. Feb. 8-10.

North Central Branch. A.A.E.E.. President Hotel. Kansas City. Mo.. March 23 & 24.

Pacific Slope Branch. A.A.E.E.. Hotel Casa del Rey. Santa Cruz. Calif.. June 14. 15 & 16. 1950.

Supplying the Nation

We are in a position to supply any mixtures of soluble mineral salts, copper, manganese, zinc, iron, etc.

One of the nation's foremost producers of agricultural chemicals and soluble mineral salts.

For complete information, write the Tennessee Corporation, Grant Bldg, Atlanta, Ga. or Lockland, O.

COPPER SULPHATE

•

ZINC SULPHATE

•

COPPER CARBONATE

•

MANGANESE SULPHATE

TENNESSEE TC CORPORATION

of the U. S. Patent Office, to preempt the use of the names as trade marks.

The five common names, with their designations, are:

Ferbam

for the fungicidal chemical, ferric dimethyl dithiocarbamate which has the empirical formula, $FeC_9H_{15}N_3S_6$.

Ziram

for the fungicidal chemical, zinc dimethyl dithiocarbamate, which has the empirical formula, $ZnC_6H_{12}N_2S_4$.

Nabam

for the fungicidal chemical, disodium ethylene bisdithiocarbamate, which has the empirical formula, $Na_2C_4H_6N_2S_4$.

Zineb

for the fungicidal chemical, zinc ethylene bisdithiocarbamate, which has the empirical formula, $ZnC_4H_6N_2S_4$.

Thiram

for the fungicidal chemical, tetramethylthiuram disulfide which has the empirical formula, $C_6H_{12}N_2S_4$.

The names were chosen only after consultation with various Government Agencies and with collaborators, the announcement said.

•

N. Central AAEE Meets

The North Central States Branch of the American Association of Economic Entomologists will hold its next annual conference March 23 and 24, 1950 at the Hotel President, Kansas City, Mo., it was announced by the organization's secretary, Dr. J. W. Apple, Wisconsin College of Agriculture, Madison, Wis. Program preparations have been started by a committee headed by Dr. Roscoe E. Hill, department of entomology, Univ. of Nebraska, Lincoln, Nebr.

•

May Ship New Product Now

Permits have been granted by the Production and Marketing Administration of the U. S. Department of Agriculture for the shipment, for experimental purposes, of powders containing "W.A.R.F. 42," new rodentical chemical. R. J. Prentiss & Co., Inc. and S. B. Penick & Co., both of New York, were granted permits. Products allowed to be shipped, and now available for experimentation, are powders containing one-half of one percent of the active ingredient.

•

Northwest Meeting Planned

The annual meeting of the Northwest Insect Control Conference for 1950 was being planned at press time, according to David H. Brannon, State College of Washington, Pullman, Wash. The dates, tentatively set for January 23-25 at Portland, Oregon, were subject to change, he said, since they were contingent upon dates to be selected by the Northwest Spray Conference which also plans to hold a meeting in Portland. The N.I.C.C. will hold its meeting either immediately preceding or following the N.S.C. event, Mr. Brannon said.

•

Reports To United Nations

Melvin Goldberg, Pesticide Advisory Service, New York, recently served as a consultant to the Economic Stability and Development Division of the Secretary General's Office of the United Nations in a survey on world wide availability of antimalarial chemical insecticides.

The report was presented at the recent meeting of the United Nations Economic and Social Council held in Geneva. It is expected that the program for insect control will be included within the program of technical assistance when established.

•

"D-D" Not a Common Name

It has been pointed out to *Agricultural Chemicals* that the trade name "D-D" is registered by Shell Chemical Corporation, New York, and not a common name for a chemical substance. The latter use was made of the term in a recent article in this magazine, which brought a letter of correction from G. E. Brewer, secretary of Shell Chemical Corp. "Use of this trademark in a descriptive sense, as in the article to which we have referred, tends to damage our proprietary right in the trademark," Mr. Brewer writes. "This is particularly so since the reference in the article is not to the soil fumigant made by us," he concluded.

Phytopath Meeting Planned

Preliminary arrangements for the forty-first annual meeting of the American Phytopathological Society have been announced by the group's officers. The meeting, to be held at the Martinique Hotel, New York City, will continue for three days beginning December 28. The convention will be in connection with the annual meeting of the American Association for the Advancement of Science.

A Business meeting is to occupy the morning of Wednesday, and section meetings are scheduled to be held in the afternoon. The evening program is to include a presidential session with the AAAS, and special conferences.

Thursday morning and afternoon are set aside for section meetings, and the annual banquet is to be held in the evening, with more section meetings following. The last day of the convention will see the section meetings continued, a business session, and a joint gathering with the Mycological Society of America.

A fungicide colloquium is planned, with the opportunity being extended to industry to exhibit fungicidal products on tables and to have available printed or mimeographed descriptive literature to be picked up by those in attendance. All such exhibits should be cleared through the committee, headed by Dr. L. Gorden Utter, Phelps Dodge Refining Corp., 40 Wall Street, New York. Manufactures are invited to contact Dr. Utter for further information.

•

Toxaphene Quotation Down

A reduction in the price of technical toxaphene has been announced by Hercules Powder Company, Wilmington, Del.

The new low price is 20 cents a pound, as compared to the previous price of 24 cents per pound, and is retroactive to October 1, the company states. The current price of 20 cents per pound is expected to remain firm through September 30, 1950.

Hercules officials said that when technical toxaphene was introduced in 1946 the price was 35 cents per pound. Since 1946, technical toxaphene manufacturing facilities have been greatly expanded in order to meet steadily increasing demands.

Despite the expansion in manufacturing facilities the supply was insufficient to satisfy all requirements this year. To meet still larger demands in 1950, production facilities have been further expanded, Hercules officials reported.

Dow Ag. Chem. Sales Meeting

Dow Chemical Company salesmen from all parts of the nation met at Midland, Michigan, recently to study the newest uses for the firm's line of weed killers, insecticides, fungicides and other agricultural chemicals. The meeting included talks by Leland I. Doan, president of Dow, and by a representative of the "Farm Journal." The photo shows the group assembled for the sales meeting.

•

Sheals Asst. Bureau Chief

The U. S. Department of Agriculture has announced the appointment of Ralph A. Sheals as Assistant Chief of the Bureau of Entomology and Plant Quarantine, effective October 1. Dr. P. N. Annand, chief of the Bureau, said that Mr. Sheals succeeds Edmund Stephens as Assistant Chief of Bureau in Charge of Administration. Mr. Stephens is transferring to a similar position in the Department's Bureau of Plant Industry, Soils, and Agricultural Engineering.

Mr. Sheals has been associated with the U. S. Department of Agriculture since 1917. He joined the Bureau's Division of Domestic Plant Quarantines in 1928, and was assistant leader of that Division from 1929 to 1942. From that time until 1947 he was in charge of the Division of Gypsy Moth Control, with headquarters at Greenfield, Mass. In 1947 he left the Department for a short period to engage in commercial pest control work, returning to the Bureau in 1948 to head the golden nematode control project, with headquarters on Long Island, N. Y. In his new position Mr. Sheals will be responsible for administrative matters connected with the work of the Bureau.

•

Brooklyne Names Kovitz

Julius Kovitz has been appointed general manager in charge of all chemical and metallurgical operations at the Brooklyne Chemical Works, Inc., Baltimore, Md., the company has announced. Mr. Kovitz is a graduate of the Massachusetts Institute of Technology where he served on the teaching staff from 1938 to 1941. During World War II, he was a captain in the Chemical Corps stationed at the Technical Command, Edgewood Arsenal, Maryland. The new appointee has been with Brooklyne since 1941, except the time he was serving with the Chemical Corps during the war.

•

PCO's Name Jennings

In its 17th annual meeting at the Biltmore Hotel, Los Angeles, Calif., October 17-19, the National Pest Control Association elected Harold E. Jennings, Chicago, as president. He succeeds V. H. Montgomery, San Francisco. John Medoff, W. New York, N. J. was named vice-president.

•

Chemical Exposition in N. Y.

Manufacturers of agricultural chemicals are included among exhibitors at the 22nd Exposition of Chemical Industries to be held at Grand Central Palace, New York, November 28 to December 3.

To New Orleans Post

Oronite Chemical Co., New York, has announced that John H. Selby, sales representative, has been transferred to New Orleans. From that point, Mr. Selby will handle sales work in the states of Tennessee, Georgia, Florida, Alabama, Mississippi, Louisiana, Arkansas, Oklahoma and Texas. Oronite is a wholly-owned subsidiary of Standard Oil Co. of California and manufactures petroleum-based chemical products.

•

Offers Testing Service

A service for evaluating agricultural chemicals which has been in operation for several years at Belle Glade, Florida, is entering its winter season. This testing service, developed by Dr. G. R. Townsend, is used to evaluate potential fungicides, insecticides and weed killers.

By means of the Florida tests, manufacturers of chemicals are able to gain a whole season in their testing program and thus speed up their research and development program, Dr. Townsend points out. These tests are especially suitable for chemicals which have shown some promise in greenhouse or a single season of field tests in the north.

The test plots cover 10 acres, allowing a considerable amount of latitude for different crops, dosages and replications. The season at Belle Glade runs from early September to the end of April with two crops for most plants. This is a muck area with principal crops including potatoes, tomatoes beans, celery, carrots, sweet corn, cabbage, etc. Other annual crops may be used also. Most of the important northern diseases and insect pests are present, including early and late blight on potatoes and tomatoes, and the celery blights. Seed and soil treatments also can be run. An abundant local weed flora provides many of the important grass and broad leaf weeds for testing the various methods of chemical weed control.

Dr. Townsend is a graduate of Cornell University, Ithaca, N. Y. Before setting up his testing service, he was for many years a plant pathologist with the Florida Agricultural Experiment Station.

•

Farm Show Set to Go

Chemical manufacturers and makers of spray equipment are expected to be among the exhibitors at the third annual National Farm Show at the Chicago Coliseum, November 26 through December 3, 1949. The event is expected to draw farmers from a wide area, and attendance is expected to number into many thousands, according to Joe Vancil, Chicago, manager of the show.

•

Chilean Nitrate Drops

Reductions of $3 per ton of Chilean Nitrate of Soda were announced as being effective October 10. The new prices were being quoted at $48 per ton in bulk and $51 per ton in paper bags.

DDT

2,4-D

Acid, Salt and Isopropyl Ester

AVAILABLE FOR PROMPT SHIPMENT

EXCLUSIVE SALES AGENTS FOR

MONTROSE CHEMICAL CO.

120 LISTER AVENUE — NEWARK 5, N. J.

R. W. GREEFF & CO., INC.

10 Rockefeller Plaza, New York 20, N. Y. — Tribune Tower, Chicago, Illinois

S.A.S.I. Meets Jan. 23-24

The Southern Association of Science and Industry will meet January 23 and 24 at the Hotel Roosevelt, New Orleans, La., it has been announced. Reports will be made on research in the field of agricultural insecticides, liquid fertilizers, and in improved methods of increasing farm produce. Appearing on the advance program, were the names of prominent Southern scientists, agriculturists and industrialists, including S.A.S.I. president, Dr. Stewart J. Lloyd, Dean of the School of Chemistry at the University of Alabama.

•

Plan New Plant

A new million dollar plant is expected to be put into operation by the Tennessee Products & Chemical Corp., at Chattanooga, Tenn., in the near future. At the start of operations of the new plant the company plans to produce benzyl alcohol, benzoic acid and similar chemicals. The list will be expanded later to include esters and chlorinated products and chemicals from its nearby coking plant.

•

Ill. Sprayers to Meet

A tentative date has been set for the 1950 meeting of the Illinois Commercial Ground Spray Operators Association, according to Robert Kirkpatrick, Princeton, Ill., secretary of the group. The definite time was to be finally set at a committee meeting on November 2, but the dates were expected to remain as January 16-18, 1950.

•

Canadian Group Meets

The organizational meeting of the Canadian Prairie Agricultural Chemical Association was held October 20 and 21 at the Royal Alexander Hotel, Winnipeg, Manitoba. The proposed Association would be composed of basic producers, jobbers and distributors of all types of agricultural chemicals in western Canada. Due to the diversified nature of agriculture in Canada, and because of the distances involved, it was considered that the proposed organization should have a distinct local aspect.

By-laws, objectives and other considerations were placed in the hands of sub-committees who were to report their findings at the Canadian Weed Conference at Edmonton, Alberta, November 15-17. Chairman of the organizational meeting was Dr. Frank Greaney, Northwest Line Elevators, Winnipeg. Secretary is Robert Hastings, Hastings & Sons Co., Ltd., Winnipeg.

NAIDM Meets in December

Aerosols and insecticides are included among subjects to be discussed at the 36th annual meeting of the National Association of Insecticide and Disinfectant Manufacturers to be held at the Mayflower Hotel, Washington, D. C., December 5 & 6. Included as speakers are Drs. S. A. Rohwer, F. C. Bishopp and E. F. Knipling, U. S. D. A., and M. D. Farrar, associate director of the Crop Protection Institute, Durham, N. H.

for

WEED KILLING

When you select TEEJET spray nozzles, you can be sure of the best in spray nozzle performance. The reason is simply this: Teejet design began many years ago in cooperative research programs with agricultural experimental stations and America's leading chemical and equipment manufacturers. As these programs grew and called for nozzle production, Spraying Systems designed and built the many special machine tools that alone can produce nozzles to the high precision required for uniform spray distribution . . . at a reasonable cost. When you select TEEJET nozzles you can be sure of customer satisfaction. Write for Bulletin 55 for complete information on TEEJET nozzles for WEED KILLING and all other farm needs.

SPRAYING SYSTEMS CO.
3230 RANDOLPH STREET
BELLWOOD • ILLINOIS
Suburb of Chicago

- Interchangeable orifice tips
- Built in sizes and types for WEED KILLING and all other farm spraying needs
- For spray rigs and hand sprayers

THANKSGIVING...1949!

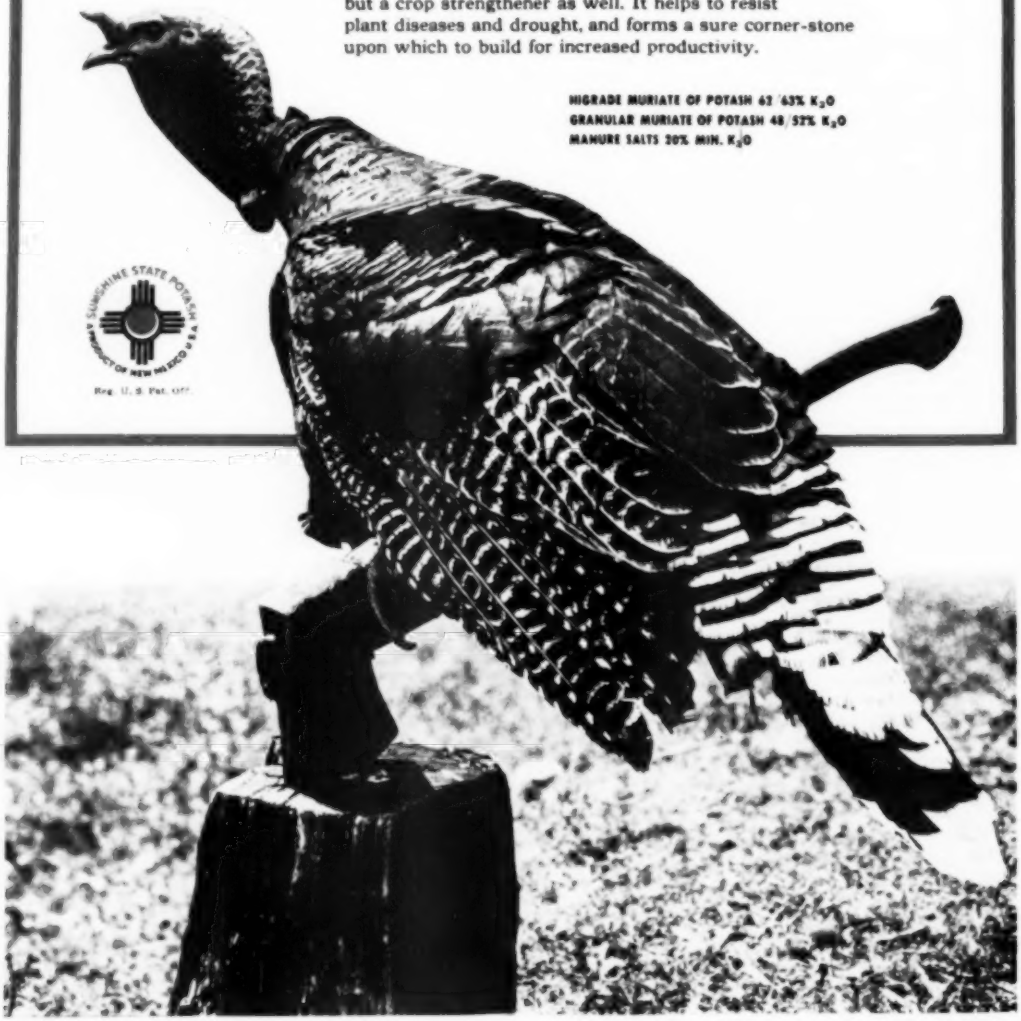
In a disturbed and troubled world, we Americans have so much to be thankful for. Just for a single example, consider the rich bounty of our farms which give us food stuffs in such abundance. An abundance on which we have built for ourselves the world's highest standards of health and living.

To this rich abundance, fertilizers contribute vitally. Many of these fertilizers are compounded with potash—often with Sunshine State Potash, a product of New Mexico. For potash is not only a vital soil nutrient, but a crop strengthener as well. It helps to resist plant diseases and drought, and forms a sure corner-stone upon which to build for increased productivity.

HIGRADE MURIATE OF POTASH 62/63% K_2O
GRANULAR MURIATE OF POTASH 48/52% K_2O
MANURE SALTS 20% MIN. K_2O

SUNSHINE STATE POTASH PRODUCT OF NEW MEXICO U.S.A.

Reg. U. S. Pat. Off.



UNITED STATES POTASH COMPANY, *Incorporated*, 30 Rockefeller Plaza, New York 20, N. Y.

Fertilizer News

NFA Program Announced

The agricultural situation with particular reference to fertilizer was slated for discussion at the annual fall meeting of the National Fertilizer Association, scheduled to be held at the Atlanta Biltmore Hotel, Atlanta, Ga., November 14-16. A special feature of the program was to be the appearance of a member of a visiting delegation of British fertilizer industry executives.

According to advance notices issued by the Association, the first day's program was to be devoted to meetings of the Board of Directors and of various committees, with the meeting proper opening on the morning of Tuesday, Nov. 15. In addition to a talk by the British industrialist, the program called for talks by Dr. F. W. Parker, assistant chief, Bureau of Plant Industry, Soils and Agricultural Engineering, U. S. Department of Agriculture, and William L. Padgett, of the Economic Cooperation Administration. Mr. Padgett was expected to describe the technical assistance that ECA is rendering to European business and industry, and another of the British delegation was to discuss British fertilizer problems.

Tentative plans also called for a showing of the motion picture, "New England's Green Pastures," produced by agricultural and industrial leaders of New England, with the assistance of the NFA staff. The annual industry dinner was to be held on Tuesday evening at the Biltmore Hotel.

W. R. Thompson, extension pasture specialist of Mississippi State College and John L. Liles, Jr., agricultural economist, Federal Reserve Bank, Atlanta, were to appear as speakers on the Wednesday morning program. Also on the program for that morning, was a panel of experts to discuss soil improvement. Members of the panel were to include Channing Cope, author-farmer, chairman; Alexander Nunn, managing editor, *The Progressive Farmer*; L. R. Neel, editor, *Southern Agriculturist*, and James M. Eleazer, information specialist, Clemson Agricultural College.

•

Gates Appoints Wilkins

George F. Wilkins has been appointed General Manager of the Fertilizer Division of Gates Bros.,

GEORGE F. WILKINS

Inc., Wendell, Idaho, according to an announcement by Mr. Charles T. Gates, President. Mr. Wilkins also becomes an active member of the Board of Directors of the corporation.

For 19 years Mr. Wilkins was associated with the General Chemical Division of Allied Chemical & Dye Corp., having been in production, research, and for the past ten years in the Technical Service Dept. For the past nine years he was in charge of General's west coast service department.

•

Bagpak Division Appoints

International Paper Company's Bagpak Division has appointed Hugh O'Neill as sales representative in northwestern Ohio, northern Indiana, and part of Michigan, the company has announced. Mr. O'Neill's office is at 2408 Terminal Tower, Cleveland 13, Ohio.

W. W. Hendrickson, previously of this territory, will continue as sales representative in the sections of Ohio and Indiana not covered by Mr. O'Neill, as well as in Kentucky and Buffalo and Niagara Falls, N. Y. Mr. Hendrickson's office address is the same as that of Mr. O'Neill.

•

Anaconda Expands Plant

Anaconda Copper Mining Co., Anaconda, Montana, has completed its new sulfuric acid plant which has a rated production of 150 tons per day. Increasing demand for superphosphate fertilizers in the western states has prompted the company to expand its facilities.

Additional equipment has been installed in the company's present Treble Superphosphate plant, to utilize the extra amounts of acid now available. The new addition will practically double Anaconda's production of treble superphosphate.

•

George Sneed Dies

George W. Sneed, formerly in charge of the Sulphur Division of the Southern Acid & Sulphur Co. at St. Louis prior to its acquisition by the Mathieson Chemical Co. died September 13 in St. Louis. He was taken ill last March and had not been active in business since that time. He was well known in the agricultural chemical field for many years.

•

New Co-op Plant Dedicated

A new co-op fertilizer plant, opened August 18, at Muskogee, Oklahoma, is expected to produce from 25,000 to 30,000 tons of fertilizer annually. The factory, located on a 28-acre site, is 126x145 feet, and is equipped with modern mixing machinery. Operations will be under the management of Consumers Cooperative Association, Kansas City, Mo., with K. A. Schmitt as resident manager.

To mark the opening of the plant, a parade and barbecue dinner were held, and talks were given by officials of the co-op, representative of Oklahoma A. & M. College and the M. K. & T. railway, which serves the plant. Some 6,500 farm people attended the event.

NFA Sponsors Tour

A five-day tour of key agricultural developments in Arizona and California was scheduled to be taken by a group of industrial soil and crop specialists, beginning October 31. The event, under the auspices of the Plant Food Research Committee of the National Fertilizer Association, was to begin at Phoenix, Ariz., and move on through the Salt River Valley. The group planned to fly to El Centro to visit experiment stations and farms in the Imperial Valley on Nov 1, and then proceed to Mexico for a brief stop. Subsequent visits were to be made at the citrus groves at Riverside, Calif.; the U. S. Cotton Experiment Station at Fresno; and points of interest in the Salinas Valley. The tour was to end at Monterey.

Those expected to go on the tour were:

Karl P. Ahlswede, Ahlswede Fertilizer Company, Riverside, California; S. D. Gray, American Potash Institute, Washington, D. C.; Proctor Gull, Spencer Chemical Company, Kansas City Missouri; E. W. Hansen, Simplot Soilbuilders, Inc., Idaho Falls, Idaho; Omer J. Kelley, U. S. Department of Agriculture, Fort Collins, Colorado; F. H. Leavitt, Shell Chemical Corporation, San Francisco, California; D. D. Long, International Minerals & Chemical Corporation, Chicago, Illinois; Wallace Macfarlane, Pacific Guano Company, Los Angeles, California; G. F. MacLeod, Sunland Industries, Inc., Fresno, California; M. E. McCollam, American Potash Institute, San Jose, California; J. F. Wood, Texas Gulf Sulphur Company, Inc., Houston, Texas; and M. H. McVickar, National Fertilizer Association, Washington, D. C.

•

Maine Fert. Plant Started

American Industrial Development Corporation, New York, has announced that construction of a unit for the manufacture of sulfate of ammonia by the Kuhlmann Process has been started for Northern Chemical Industries, Inc. at Searsport, Maine. General Contractor is Graver Construction Co., New York, a division of Graver Tank & Mfg. Co., Inc., East Chicago, Ind. Northern Chemical Industries, Inc. is a subsidiary of Summers Fertilizer Company, Inc., Baltimore, Md.

•

Mathieson Adds Two

Mathieson Chemical Corporation has added two new members to its agricultural chemical sales staff, it has been announced by S. L. Nevins, Vice President, Director of Agricultural Chemical Sales. W. W. Knight has been named Sales Manager, Arkansas Fertilizer Company Division, with headquarters in North Little Rock, and P. F. Schowengerdt has been appointed Manager, Agricultural Chemical Sales, North Central Division, with headquarters in St. Louis.

Mr. Knight comes to Mathieson with some thirty years experience in agricultural and for the past sixteen years has been with the Temple

PYRAX ABB is the most widely used Pyrophyllite in the agricultural field as a carrier for insecticides and fungicides.

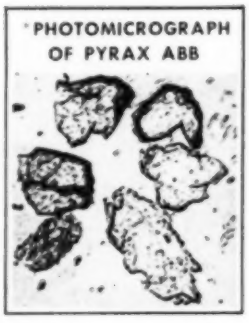
CHEMICALLY INERT — pH BETWEEN 6.5 AND 7.0— The toxic strength of rotenone, pyrethrum, fixed coppers and the newer organic toxicants for agricultural dusts are unaffected by **PYRAX ABB,** *even when stored from season to season.* These characteristics have permitted satisfactory insect control with the use of *less toxicant,* thus minimizing the residue problem.

NONHYGROSCOPIC — FLAKY PARTICLE SHAPE* — Free-flowing **PYRAX ABB** mixes quicker and more homogeneously, and gives a more even feed from the hopper. Mixed correctly, it even gives free-flowing dust with the newer waxy and oily toxicants.

NON-DRIFTING—STICKING— A dense cloud that hugs the crop and adheres electrostatically (even to the under side of foliage when dry) insures less waste and permits effective daytime dusting.

PYRAX ABB

VANDERBILT AIDS FOR AGRICULTURE
Pyrophyllite—PYRAX ABB
Clays—CHEROKEE
CONTINENTAL
Dispersing Agents —
DARVAN #1
DARVAN #2
Suspending Agent, Spreading and Sticking Agent } VEEGUM



R. T. VANDERBILT CO., Inc.
SPECIALTIES DEPARTMENT
230 PARK AVE., NEW YORK 17, N. Y.

Cotton Oil Company of North Little Rock. He is a member of a number of associations in the field and has held office in the Valley Oil Seed Processors Association and the National Cottonseed Products Association.

Mr. Schowengerdt, before entering sales work, held various positions in agricultural development, from county agricultural agent, in 1918, to Assistant to the General Agent, Farm Credit Administration, St. Louis, from 1940 to 1947. Before joining Mathieson, he was sales manager of a wholesale seed business. He is a member of Gamma Sigma Delta, honorary agricultural fraternity, and for the past ten years has been a director of the Commerce-Warren County Bank, Warrenton, Missouri.

•

New Phosphate Fertilizer

Permanente Metals Corp., Permanente, Calif., is now producing a new phosphatic fertilizer with an available phosphoric acid content of 18 percent, it has been announced. The company, an affiliate of the Henry J. Kaiser enterprises, states that the product, "Thermo-Phos Granular," does not dissolve in water and remains in the soil longer to furnish plants with nutrients over a longer period of time. The material is designed for direct application to soil.

The product is produced by fusion in high temperature electric furnaces. Special phosphate rock from Idaho is fused at 2,800°F. to recombine the phosphates into a form available to growing plants. The Permanente Co. has three 8,000-KVA electric furnaces, each capable of producing more than 200 tons of "Thermo-Phos" fertilizer per day. The phosphate rock is fed into open furnace pits by gravity flow, and the furnaces are tapped at regular intervals. A quenching process then granulates the material which is later stockpiled, bagged and shipped.

•

Contest Winners Named

Awards to the winners of the $15,000 Nation-wide essay contest sponsored jointly by the National Grange and the American Plant Food Council, were made October 22, by Secretary of Agriculture Charles F. Brannan. The awards were presented at a dinner arranged by the sponsoring organizations at the Mayflower Hotel in Washington. Other distinguished guests in attendance included members of Congress, farm organization leaders, Government officials and others prominent in agriculture.

Albert S. Goss, master of the National Grange and Clifton A. Woodrum, president of the American Plant Food Council announced the winners of the National contest as follows: First prize, Buick automobile, Wilfred M. Schutz, 19, Eustis, Nebraska; second prize, Chevrolet automobile, Miss Natalie Snyder, 18, Pittstown, N. J.; third prize, $750 in cash, Jack Hardy, Blackstone, Va.; and fourth prize, $250 in cash, Mrs. June McKnight, 18, Street, Maryland.

In addition to Secretary Brannan, who was chairman of the National Board of Judges for the contest, the essays were judged by Dr. Hugh H. Bennett, Chief, Soil Conservation Service, U.S.D.A.; Mrs. Malcolm Byrnes, president, National Home Demonstration Council, Ethel, La.; Dr. W. T. Spanton, chief, Agricultural Education Service, U. S. Office of Education; and Dr. M. L. Wilson, Director of Extension Work, U. S. D. A.

In commenting on the contest, Mr. Goss stated that "this contest has served a worthwhile purpose in stimulating the youth of the Nation in both thinking and action on the important problems of our land and its care."

Mr. Woodrum commented that the fertilizer industry recognizes that the fertility of soils must be replenished and increased "if agriculture is to continue to play an important role in maintaining our high standards of living." He emphasized that "agriculture and industry must assume a joint responsibility in encouraging our young men and women to assume leadership in the protection of our vast farming resources."

•

Plant Nears Completion

Construction work at the million-dollar Gates Bros. plant at Wendell, Idaho, has been completed on units which produce wet process phosphoric acid for use in the manufacture of triple superphosphate, the company has announced. The plant was built in cooperation with the Idaho Farm Bureau and will produce an estimated 100 net tons of triple superphosphate per day. Fertilizer, to be marketed by the farm bureau, is expected to be in production before the end of 1949.

—Photo Courtesy U. S. Soil Conservation Service

Farmer Albert Roth, Saginaw, Michigan, wished to demonstrate the virtues of nitrogen fertilizer in a dramatic manner. So he spread a quantity by hand in the form of his initials, with the results shown above. For a long time during the summer, the extra green letters "AR" stood out in the field.

Joint Comm. on Fertilizer Application Meets

THE twenty-fifth annual meeting of the National Joint Committee on Fertilizer Application was held in Milwaukee, Wisconsin, October 24, the day before the American Society of Agronomy and the Soil Science Society of America opened their sessions in the same city.

Ove F. Jensen of E. I. du Pont de Nemours and Co., Inc., first secretary of the National Joint Committee, reviewed its history and credited it with initiating research on fertilizer placement which has led to more efficient plant-food usage.

Using Kodachrome slides, Glenn A. Cumings of USDA in a general discussion of "Fertilizer Distributing Machinery" brought his hearers up-to-date with developments in that field, and the new film, "What's in the Bag," made by the National Fertilizer Association, was shown. This picture, which runs for a half hour, tells why a 100-pound sack of fertilizer cannot contain 100 pounds of plant food.

Dr. O. T. Coleman, Missouri Agricultural Experiment Station, presented data showing that fertilizer must be in the moist zone of the soil to be available to plants. Under adverse soil conditions, such as soil compaction, deep placement seemed to stimulate root penetration and to raise yields considerably, Dr. Coleman said.

The fact that good stands of legumes can be obtained with high yields of wheat was shown by data presented by H. R. Lathrope, Indiana Agricultural Experiment Station. The key to success, Mr. Lathrope explained, is the use of adequate amounts of plant food. Liberal amounts of nitrogenous top dressings do not reduce legume stands when used in conjunction with adequate supplies of phosphoric acid and potash.

"A Producer's Method of Fertilization for High Yield and Quality Corn Production" was discussed by P. E. Grubb, DeKalb Agricultural Association. With the aid of a movie made on his own farms, Mr. Grubb stressed the teamwork of commercial fertilizers, good management and organic matter.

B. A. Krantz of North Carolina Agricultural Experiment Station told the group that good seed and proper cultural practices must be followed to get most efficient use of fertilizer.

"How Fertilizer Can Be Applied through Irrigation Water" was explained by F. H. Leavitt, Shell Chemical Corporation. Slides were used to demonstrate the procedures used with different types of irrigation.

Samuel Tisdale, N. Carolina Experiment Station, stressed proper placement of nitrogenous fertilizer as essential for high yields of quality crops. Under Carolina conditions, plow-sole applications were not superior either to row or side-dress applications. Mr. Tisdale stated that "Climatic conditions determine the best method of application."

As our agriculture becomes

older, and as we push up yields, deficiencies of minor elements will become more common, and already this has taken place in many areas, according to F. E. Bear, New Jersey Agricultural Experiment Station. When this happens, he said, minor elements must be supplied in one way or another. Dr. Bear added that quality, as well as quantity, should be the goal of American agriculture.

N. S. Hall, North Carolina Agricultural Experiment Station, presented results obtained from experiments with radioactive elements. The data showed that fertilizer must be close at hand to be utilized by the young plant. As the root system develops, plants are able to forage for themselves better.

The need for research was discussed by R. H. Bray, Illinois Agricultural Experiment Station. "What may not seem practical may pave the way for progress" was the general theme of Dr. Bray's remarks.

The speakers on the program were introduced by A. L. Lang, program chairman, after he was introduced by C. H. Mahoney, general chairman of the National Joint Committee on Fertilizer Application. Dr. Mahoney also introduced the new officers for the coming year:

General chairman, A. L. Lang, Illinois Experiment Station; Vice chairman, R. M. Merrill, John Deere and Company; and secretary-treasurer, Malcolm H. McVickar, The National Fertilizer Association.

•

Kansas Aerial Conference

The tentative program has been released for the Airport and Aerial Spray Conference to be held at Manhattan, Kansas, Nov. 30 and December 1 & 2. Some of the speakers, and their subjects, include H. E. Myers, Kansas State College, "Application of Fertilizers and Seed by Plane;" J. C. Frazier, also K.S.C., "How 2, 4-D Kills." Wm. Phillips, U.S.D.A., Hays, Kansas, "Control of Weeds in Wheat;" and an address of welcome by Milton S. Eisenhower, president of K.S.C.

L. M. Stahler, U.S.D.A., Brookings, S. D. will talk on "Aerial Spraying for Weed Control," and a summary of 1949 results and recommendations for 1950 will be presented by G. L. McCall and J. W. Zahnley, K.S.C. Dr. George C. Decker, Illinois Natural History Survey, Urbana, Ill., will discuss "Use of Airplanes in Insect Control;" J. F. White, Julius Hyman & Co., "Insecticide Formulation and Rates of Application for Aerial Application."

A round table discussion on "Experiments with airplane application of insecticides in 1949" will be held, with seven members of the panel. These will be Drs. Roger C. Smith and W. F. Pickett, and Prof. R. W. Campbell, K.S.C.; Don E. Pratt, flight operator, Hays, Kan.; Dr. B. B. Hodgden, Kans. State Board of Health; W. E. McCauley, Julius Hyman & Co.; and Bob Wakeman, California Spray Chemical Co., Kansas City.

The remainder of the program was to include a summary of present spray equipment; a paper on aerial spray equipment; and a number of question and answer periods.

AAEE MEETS

(Continued from Page 41)

cides and Application Equipment, will discuss recent developments in the use of agricultural insecticide equipment, while Kenneth Messenger, Bureau of Entomology and Plant Quarantine, U.S.D.A., will discuss the question, "Shall we design or select our pest control equipment?" Frank Irons, Bureau of Plant Industry, Soils, and Agricultural En-

CLAYS

Particularly Suitable for Use in

AGRICULTURAL DUSTS

- NON-ABRASIVE
- NON-ALKALINE

Technical Data together with Testing Samples Sent upon Request

UNITED CLAY MINES CORPORATION
TRENTON • Established 1905 • NEW JERSEY

gineering, U.S.D.A., is scheduled to speak on the role of the engineer in developing insecticide equipment. The session will conclude with a report by J. L. Brann, Department of Entomology, Cornell University, on "Investigation of Insecticide Equipment."

On the program of the other special section on insecticide resistant insects, Dr. A. M. Boyce, A.A.-E.E. president, will present a resume of insecticide-resistant insects in California. He will be followed by Drs. Decker and W. N. Bruce, University of Illinois, who are expected to present data on the resistance of house flies to insecticides. The resistance of flies to DDT will be discussed by S. W. Simmons, U. S. Public Health Service, Savannah, Ga., and the subject will be carried further by W. V. King, B.E.P.Q., who will review studies at the Orlando, Fla. laboratory on insecticide resistant insects. Concluding the program for the morning will be a paper by Floyd Smith, B.E.P.Q., and W. E. Blauvelt, Cornell University, "Studies on Resistance of Red Spiders to Parathion."

Friday afternoon's program is to consist of submitted papers on insects affecting cereal and forage crops, and on insecticides and equipment.

No formal program, as such, is on the agenda for Saturday, December 17, although a bus tour to citrus packing sheds, citrus groves, processing plants, the Citrus Experiment Station, phosphate mines, etc. has been arranged for those attending the meeting. Elaborate plans for entertainment of ladies attending the convention have been made.

Industry, official agencies and independent researeh groups are invited to announce new insecticides either for experimental or commercial use in 1950. Such speakers are limited to five minutes, and should have 300 copies for distribution. Write Dr. L. B. Norton, Dept. of Entomology, Cornell Univ., Ithaca, N. Y. for details.

INDUSTRY

(Continued from Page 43)

of the completely synthetic allyl homolog of cinerin I (often erroneously referred to as "synthetic pyrethrum") was published in the October, 1949, issue of *Soap and Sanitary Chemicals* by R. B. Stoddard and W. E. Dove of U. S. Industrial Chemicals, Inc. This excellent review points up the whole situation on this material in a clear and well defined manner and emphasizes that much additional work must be done before the complete entomological evaluation is possible.

The authors relate, as has previously been reported, that the commerical production, certainly of amounts sufficient for large scale demonstrational work, is already an actuality and at a "sufficiently reasonable cost" (about equal to the current price of "natural pyrethrins") so that practical field tests can be conducted during the next few months. In addition to announcements by U. S. Industrial Chemicals concerning

PRENTOX
PEST-TESTED
BASIC INSECTICIDE CONCENTRATES

DDT
Wettable and Dry Powders
Oil Concentrates
Emulsifiable Concentrates

CHLORDANE
Oil Concentrates
Wettable and Dry Powders
Emulsifiable Concentrates

ROTENONE
Derris and Cube
Powdered Concentrates

SABADILLA
Ground Seed
Dust Concentrate

TOXAPHENE
Wettable Powders
Dust Concentrates
Emulsifiable Concentrates

BHC
Wettable Powders
Dust Concentrates

RED SQUILL
Fortified Powder
Fortified Liquid

PYRETHRUM
Powder
No. 20 Extract

R. J. PRENTISS & CO., Inc.
110 WILLIAM STREET, NEW YORK 7, N. Y.
9 S. CLINTON STREET, CHICAGO 6, ILL.

the availability of research quantities, announcements have appeared that R. J. Prentiss & Co., S. B. Penick & Co. and McLaughlin Gormley King, among others, will offer this material in experimental quantities.

The devaluation of sterling currency by the British Government may possibly reduce the cost of pyrethrum flowers to American processors. Thus, the most recent expected price increase as announced by the pyrethrum processors to be effective October 1, may be delayed or withdrawn. Spokesmen in the pyrethrum industry are quick to point out that there is no automatic reduction in price, but simply that there is a possibility that the cost may not be as high as it had appeared to be previously.

The original price increase that was temporarily deferred would have ranged from 10% to 20%. However, the price action does not in any way affect the tight supply situation which has existed for several months.

* * *

The recent meeting of the American Chemical Society in Atlantic City has set in motion the machinery for the formation of still another group to consider the chemistry of pesticides. The contemplated organization is to be set up as part of the Division of Agricultural and Food Chemistry and is to be devoted to "the chemistry of insecticides, fungicides and related materials employed in protecting the food supply." It is the plan of this group to emphasize the "chemistry" of these materials above all other considerations.

LISTENING POST

(*Continued from Page 49*)

purposes, their use on cereals, especially wheat, was at times suggested when effective mercurials were not available. These non-mercurial organic fungicides do not eliminate the smuts in oats or the stripe-disease in barley and therefore should not be recommended for these two cereals. They may be satisfactory for treating wheat for the control of bunt when better materials are not available.

Effects on Yields of Wheat

MOST workers attribute the yield increase that often follows cereal seed treatments to control of seed-borne diseases, but some have suggested that at least part of it might result from direct growth stimulation by the chemical.

During the 1948-1949 crop season, John W. Taylor and R. W. Leukel, of the U. S. Bureau of Plant Industry, Soils, and Agricultural Engineering, conducted an experiment to determine whether chemical treatment of clean sound wheat seed, sown under conditions favorable for germination and emergence, would increase the yield significantly.

Seed of Purplestraw wheat, free from bunt (*Tilletia* spp.) and, as far as could be determined, from other seedborne pathogens, was selected for the experiment. It was thoroughly cleaned, divided into portions which were treated each with a different fungicide, and stored along with a similar portion of untreated seed for one month before sowing.

The seed was sown October 18 at the rate of six pecks per acre in blocks of three rod-rows each, replicated five times for each treatment and for the check, on well-prepared land on the Plant Industry Station. The soil was a fairly uniform Keyport silt loam low in organic matter, and had been cropped to cereals every other year, alternating with soybeans and rye used for turning under.

The fungicides used for treating the seed and the average yield obtained from each treatment were as follows.

SEED TREATMENT	DOSAGE OZ./BU.	AVERAGE YIELD BU. PER ACRE
"New Improved Ceresan"	0.5	17.6
"Ceresan M"	0.5	19.6
"Ceresan M slurry"	0.5	18.5
"Spergon"	2	19.2
"Phygon XL"	2	18.3
"Arasan"	2	20.1
"Arasan S. F."	2	19.9
"Seedox"	2	18.0
"Panogen"	2	20.7
Untreated	—	18.4

In no case was the difference between the yield from treated seed and that from untreated seed of statistical significance.

Results of one season's experiment are not very conclusive. Nevertheless, the failure to obtain any significant increases in yield as a result of seed treatment of disease-free seed suggests that, under conditions similar to those of this experiment, seed treatment does not increase yields except as a result of disease control. It is possible that in some soils high in organic matter and infested with certain pathogenic organisms, an effective treatment applied to apparently disease-free seed of small grains may increase yields because of its protective effect against the soil-borne pathogens.

CONTROL OFFICIALS

(*Continued from Page 32*)

trated materials, and quoted figures representing the percent of total plant food contained in mixed fertilizers from 1880 through 1949. In that period the percentage rose from 13.5 to 22.0, respectively, and Dr. Mehring stated that the average for 1950 will be still higher. Between 1880 and 1949, the rise was gradual but quite steady, he reported. In 1900, for instance, the plant food percentage was 13.90; for 1910, it was 14.80; but the percentage slipped in 1920 to 13.90. After that, however, it continued to rise so that in 1930 it was 17.90; 1940, 19.83; and 1946, 21.65.

Dr. Mehring urged the fertilizer control officials to carry the high analysis program to the farmer, pointing out that the agriculturalist has confidence in the control official's advice to use a more concentrated mixture, whereas the same good advice from a salesman would be discounted as pressure to buy. At the same time, however, the idea is gaining ground despite the acknowledged difficulty to get the farmer to change his routine ways.

In a twenty-minute color movie, Allen B. Lemmon, chief, Bureau of Chemistry of the State of California described the control activities of state officials in the citrus industry. The film, containing well-chosen shots and adequate legends, portrayed the taking of fertilizer and pesticide samples from bags, and also

pointed out the necessity for such activity by showing closeup shots of fruit which had been injured by incorrect mixtures or bad application. Shots of fertilization through irrigation canals were included; scenes in the orchards while pest control materials were being sprayed and dusted; seed disinfection, and testing laboratory scenes were important parts of the picture.

Mr. Lemmon explained that the film had been in the process of production for some time, and that it had achieved a considerable amount of success in bringing the story of control work to persons who formerly had only hazy ideas of the necessity and value of the service.

Kephart Speaks

PROS and cons of mixing 2,4-D in fertilizer were discussed by L. W. Kephart, Senior Agronomist, Div. of Cereal Crops and Diseases, USDA Bureau of Plant Industry. He said that although successful tests had been made with 2,4-D—fertilizer mixtures on lawns, public acceptance of the idea has been reserved. Among the discrediting factors are high costs when applied to large-scale use on farms; the necessity for the user to keep two kinds of fertilizer (one mixed with weed killer; the other without); the ever-present danger of using 2,4-D and fertilizer on the garden, with ruinous results; and the need for heavier applications of either fertilizer or weed control material to certain areas.

He also stated that from the standpoint of the fertilizer manufacturer, complications would arise in having to register the label of 2,4-D containing fertilizer with the PMA in the Dept. of Agriculture.

In conclusion, however, he stated that future developments may overcome these handicaps, and advised the fertilizer industry to keep alert to these possibilities.

Following Dr. Kephart's address, the reports of investigators were heard. These included information on general terms, by Dr. J. L. St. John, Pullman, Wash.; on organic nitrogen products, M. P. Ethredge, State College, Miss.; inorganic nitrogen products, J. W. Kuzmeski, Amherst, Mass.; phosphorus, J. F. Fudge, College Station, Texas; potash, R. W. Ludwick, State College, N. M.; calcium and magnesium, W. B. Griem, Madison, Wis.; and manganese, J. B. Smith, Kingston, R. I.

Boron was reported on by R. C. Berry, Richmond, Va.; zinc and copper, by Gordon Hart, Tallahassee, Fla.; mixing and segregation, E. W. Constable, Raleigh, N. C.; registration forms, Paul Ijams, Topeka, Kansas; publications, Bruce Poundstone, Lexington, K.; specimen labels, E. A. Epps, Jr., Baton Rouge, La.; and the report of the states relations committee was presented by H. A. Halvorson, St. Paul, Minn. Allen B. Lemmon, Sacramento, Calif., presented the report of the executive committee.

More proof that...

Barden Clay increases insect mortality of dusts and sprays

Toxicity of 5% BHC Dust Mixtures on Southern Army Worm Increased 100% with Barden Clay

At the Crop Protection Institute, Durham, N. H., 5% BHC dust mixtures—with Fuller's Earth as primary grinding material and Pyrophyllite as extender—produced a 50% mortality on the southern army worm. When Barden Clay was used as both the primary grinding material and as the extender—mortality jumped to 100%! Increased mortality was obtained with the Mexican bean beetle, milkweed bug, and pea aphid.

"Barden Clay Is the Most Effective Diluent with 3% DDT on Pea Aphid"

That's what the Economic Entomology Department of the University of Wisconsin Agricultural Experimental Station found when they tested 27 diluents for toxicity in connection with pea aphid control.

Larvae Mortality of 93.3% on Mexican Bean Beetle with Barden Clay—Without a Toxicant

To determine "the effect of dust diluent or carrier on the toxicities of dust mixtures," Charles R. Hunt of Cornell University studied the mortalities of fourth instar Mexican bean beetle larvae dusted with 39 separate diluents and carriers—without a toxicant. On leaves treated with Barden Clay, mortality was 93.3%—by far the highest of any diluent tested.

Because of Barden Clay's high toxicity to insects (harmless to human beings), and because of its low grit content . . . fine particle size . . . and its unusual absorbent and colloidal properties, this low-cost, scientifically blended clay is the choice of some of the country's largest mixers. Each year, thousands of tons of this refined *insecticide* clay are used for both airplane and ground dusting, and for the primary grinding of a wide range of toxicants including DDT, BHC, Toxaphene, and Chlordane. Field tests confirm the experimental data given above.

Barden Clay adds *extra power* to your product . . . *extra punch* to your sales.

Send for Your Free Working Sample!

J. M. HUBER CORP. 342 Madison Ave. New York 17, N. Y.
World's Largest Producer of Aerfloted Kaolin Clay

FOR DUST OR SPRAY...USE **BARDEN CLAY**

THE LOW-COST SCIENTIFIC DILUENT

A.E.P.C.O. Sessions

PROMPTLY Saturday morning, the one-day meeting of the Association of Economic Poisons Control Officials got under way. The annual address by president H. J. Hoffmann, St. Paul, Minn., reported notable progress during the past year, and pointed out numerous indications for similar advancement in the future, although many problems lie in the way.

Dr. Hoffmann was followed by Dr. H. W. Hamilton, secretary of the National Association of Insecticide and Disinfectant Manufacturers, Inc. Dr. Hamilton told the group that the notable advances in the fields of public health, sanitation, and better food supplies have come about through a general improvement of standards and modern facilities for dealing with such problems. He quoted census estimates that the U.S. will comprise some 180,000,000 persons in 1950, and stated that such a population could not have been sustained here a half century ago under the former conditions of filth and lack of sanitation. The food supply of that day would have been inadequate, he declared.

Bringing the problem down to the present, Mr. Hamilton emphasized that our food supply must be free from any contamination, and that it must be protected in storage and in preparation. He brought out the "essential freedom" from insect pests which man should enjoy, and stated that we need no longer tolerate flies, roaches, or tick-infested livestock.

The N.A.I.D.M. secretary discussed the need for a uniform law which would permit the industry to supply needed products in all sections of the nation without any requirement for costly, specialized labeling in a limited section. He declared that all registration should be only at the Federal level with registration lists and data being furnished to each State. Through such an arrangement, he said, the entire distribution procedure will improve and lower costs will result.

Mr. Hamilton touched on problems connected with the introduction of new ingredients for use in pesticides and sanitary products. He stated that possible duplication or overlapping of control laws could become both complicated and costly, and that the authority for enforcement of present laws should remain with the Departments of Agriculture of Federal and State Governments.

By keeping authority centralized, costly duplication of effort would be avoided. Any additional means required for the testing and verification of claims of new materials should be placed at the disposal of State Control Officials, he recommended.

Lea S. Hitchner, executive secretary and treasurer of the National Agricultural Chemicals Association, Washington, told the group that the future practices of fruit and vegetable growers in the U.S. are likely to be influenced by the forthcoming tolerance hearings called by

COPPER SULPHATE

Crystals
Superfine
Powdered

•

Basic
Copper Sulphate

•

Neutral Basic Zinc

55% Zinc as metallic

The High Test Nutritional Zinc

Agricultural Sales Agents

W. R. E. ANDREWS SALES CO.

1505 Race Street, Philadelphia 2, Pa.

Since 1926

Agricultural Chemicals Specialists

"PHYLLITE"

TRADE NAME
PYROPHYLLITE

— • —

The World's Greatest Diluent & Carrier Absolutely Non-Abrasive and Adheres Readily to Foliage and all Surfaces.

PHYLLITE'S UNIFORMITY IS UNSURPASSED

A chemical analysis run consistent in every batch of PHYLLITE assures the insecticide manufacturer of absolute uniformity for use as diluent and carrier. PHYLLITE is ground in a Raymond Mill—95% through 325 mesh. Has a low pH (5.1).

IMMEDIATELY AVAILABLE

- *Write us for helpful information and a generous sample.*
- *Packed in 50 lb. valve bags. 20 ton lots. Lowest prices on West Coast, F.O.B. plant.*
- *Smaller quantities if desired.*

— • —

PIONEER PYROPHYLLITE PRODUCERS

HANCOCK 2-2992

P. O. BOX 686 CHULA VISTA, CALIF.

FUR-AG

FURFURAL RESIDUE

The STERILIZED . . . . . Organic Conditioner

Heated to 350 F for several hours in the presence of steam and small amounts of acid, FUR—AG is freed from plant diseases, insects, seeds, and other similar contaminants. This is an important consideration in the selection of FUR—AG as the conditioner for your fertilizer.

In addition, FUR—AG has the properties you expect in a good conditioner. It speeds up curing in the pile, helps prevent mixed goods from caking and provides bulk. Best of all, FUR—AG is produced and available in volume the year around. More complete information on request.

The Quaker Oats Company

Chemicals Department

1890 Board of Trade Bldg.

141 W. Jackson Blvd., Chicago 4, Ill.

Growers use more Triangle Brand Copper Sulphate on their crops—as a protection against plant diseases—*than any other product.*

Triangle Brand is a quality product, made by modern methods, backed by 50 years of experience—a time-tested product giving you "Efficient, Low Cost Protection."

Your dealer can supply you with Large Crystals, Small Crystals, Superfine, Snow, Instant (free-flowing powder) for your Bordeaux Sprays . . . Monohydrated for Copper-Dust mixtures.

FREE! Send postcard today for *valuable booklets* "Bordeaux Mixture—its Efficient Preparation and Use"; "Bordeaux Controls Late Blight on Tomatoes." Timely, *tested* information!

Also Z-C BRAND ZINC SULPHATES

PHELPS DODGE REFINING CORPORATION

40 Wall Street, New York 5, N. Y.

230 N. Michigan Ave., Chicago 1, Ill.

MUL-SI-MO

AN EMULSIFIER OF PETROLEUM OILS

Economical - Effective

MUL-SI-MO is especially adapted for the rapid emulsification of Oils whose viscosity is 120 Saybolt or less.

RANGE COVERED

Oils with a viscosity at 120 Saybolt or less cover the great majority of oils used in Dormant and Summer Sprays.

GENERAL TEXTURE

Mul-si-mo is a thin amber-colored oily liquid about the same viscosity as Kerosene Oil.

METHOD OF USE

There is nothing complicated about the use of *Mul-si-mo.* It is just poured into the oil to be treated at the rate of ½ to 1%, depending upon the tightness of emulsion desired—then thoroughly stirred—and the process is completed.

RESULT OF MIXING AS ABOVE

A practically 100% Oil Product—No water—No Soap No Potash nor other Alkalines.

NEUTRAL PRODUCT

Mul-si-mo is Neutral. Mul-si-mo Made Emulsions are not adversely affected by pronounced saline, alkaline or acid re-acting waters.

ECONOMICAL TO USE — LOW COST

Mul-si-mo, we believe, is the cheapest and most economical Emulsifier on the market for the emulsification of the oils above specified.

NON-TOXIC TO PLANTS

Extensive tests have shown Mul-si-mo to be non-toxic to plants when used at a dilution of 1 to 100. (Plants used in tests—Coleus.) As summer oils are usually used at the dilution of half-gal. to 100 gals. water, at such dilution the rate of *Mul-si-mo* to water would be 1 to 20,000.

COST OF MUL-SI-MO

Per Gallon $4.00; 5 Gallons and up @ $3.75 per Gallon; 50 Gallon Drums @ $3.50 per Gallon, f.o.b. New York or Jersey City. (Above prices for U. S. only. Foreign prices on request.)

MUL-SI-MO SAMPLES

A 4 Oz. Sample will be sent upon request.

Mulsimo Products, Inc.

CRANBURY, N. J.

address all communications to

25 Paulus Boulevard, New Burnswick, N. J.

the F.D.A. He pointed out that those who represent the grower now have the opportunity of presenting at the hearings the results of their research, including data on economic importance and the necessity for use of agricultural chemicals. "While the establishment of proper tolerances is of interest to many organizations and groups, it is primarily a matter between the grower who must use agricultural chemicals to produce and protect the nation's food supply, and the Food and Drug Administration which is responsible for its safety," he explained.

The NAC secretary continued by saying that his association is "vitally interested" in seeing that its industry's products are used safely and with proper regard for public health. "In keeping with this policy," Mr. Hitchner stated, "NAC is offering its facilities and cooperation to the Food and Drug Administration and all other groups interested in the problem of tolerances for fresh fruits and vegetables."

He also called upon all interested agricultural groups to study the problem posed by the hearings and to formulate their policies and plans for an orderly presentation of data in the public interest. "We all have a responsibility to the general public insofar as public health is concerned, and this responsibility is fully recognized by our industry. At the same time, we all have a responsibility to the growers to make it possible for them to continue to produce an abundant supply of wholesome food," Mr. Hitchner stated.

Dr. P. B. Dunbar, Commissioner, Food and Drug Administration, Federal Security Agency, Washington, described in considerable detail the objectives and procedures of the tolerance hearings which will begin in January. He told the group that evidence will be taken on which fruits and vegetables require the use of pesticides in their production; what particular poisons are necessary; to what extent residues may be avoided; and the quantity of such residues which may be tolerated on fresh fruits and vegetables.

The Commissioner reiterated his statements made at the meeting of the National Agricultural Chemicals Association at Rye, N. Y., in May, that pesticides are acknowledged to be necessary to the production of many fruits and vegetables, but that pesticides are poisonous and must be regarded as such. He said that the terms of the Food and Drug Act do not preclude the use of pesticides, but that they must be employed to the best interest of the public health.

He then instructed the industry on what will be required of witnesses at the hearings, such as furnishing five copies of the testimony for the record; that witnesses are under oath and are subject to cross-examination; and that anyone in the industry has a right to take part in the proceedings.

Mr. Dunbar expressed the hope that all available information will be pooled in the hearings, so that when they are completed, the information sought by the entire industry will have been attained. He thanked the Bureau of Entomology and Plant Quarantine for its cooperation, and also expressed appreciation for the helpfulness of entomologists throughout the country.

C. R. Mahoney, Director of the National Canners' Association, discussed problems of the canner in relation to the use of insecticides. He called upon entomologists and plant pathologists in Land Grant colleges to make recommendations to growers of canning produce for use of insecticides and fungicides so that danger of residues may be eliminated. The responsibility of the food processor is to the public, the Food and Drug Administration and the State control officials and the grower with a half-million dollar crop has a big stake, he reminded. The produce must be free from insects and insect debris, but also free from insecticide residues. This is a difficult specification, and the grower is often at a loss to know what pesticides to use. The canner is aware of the growers' problems and all have been well alerted on the matter of toxicity, both chronic and acute, he said. Because of this knowledge, the food industry cannot afford to gamble with pesticides on which inadequate tests have been made.

The canning official reported that tests were being conducted in various parts of the country to find out all possible information on residues. Apricots are being studied in California, he said, to find how to remove possible residues on this fruit which is too delicate to withstand brushing or other means frequently employed on other products. Manufacturing methods differ in canning for different purposes, such as the use of whole apples vs the use of peeled apples . . . packing baby food products, etc. Many operations differ from others in procedure, making the over-all picture very complex.

Mr. Mahoney declared that the canners are interested in the coming tolerance hearings and in all other developments in the pesticide field. They want more factual information from all sources, he concluded.

GUEST EDITORIAL

(*Continued from Page 23*)

determining tolerances will be made less difficult.

Presumably the hearings will not be restricted to a few chemicals on fresh fruits and vegetables, or one or two uses of them. Such a policy would be unrealistic. All chemicals used to protect crops should run the gamut and be screened and classified.

Anything less than this will invite chaos. Farmers and other users of insecticides and fungicides will be confused. Agricultural pest control generally would be hampered.

In appraising the tolerance problem, we must keep constantly in mind that insecticides and fungicides, to be effective, must be poisonous and toxic to the insects and diseases to be controlled. At the same time, they must not injure the tissues of the infested host plants. Both that to be killed and that to be protected are made up of living tissues, a tight rope indeed. Now add to this the fact that

Have You a DUST BLENDING PROBLEM?

Our Engineers will be glad to help you to solve any mixing or blending problem you many have.

SPECIALISTS in INSECTICIDE DUST BLENDING EQUIPMENT

★ Address Inquiries to . . . ★

The YOUNG MACHINERY COMPANY

MUNCY PENNSYLVANIA

VELVEX

KAOLIN CLAY

For Use in Extending Insecticidal Materials

- Non-Abrasive
- Small Particle Size
- Chemically Adaptable
- Good Adhesive Qualities

For information and samples, write:

SOUTHEASTERN CLAY COMPANY

AIKEN, SOUTH CAROLINA

It pays to handle a guaranteed product

HERBICIDE

THE ORIGINAL

WEED KILLER

(NON-SELECTIVE)

Kills Grass and other Weed Growth on Driveways, Paths, Tennis Courts, Golf Traps, Coble Gutters, Factory Yards and Sidings, Parking Lots or any place where vegetation is not wanted.

Write for Literature and Prices

READE MFG. CO., INC.

Established 1885

Main Office: JERSEY CITY 2, N. J.

Factories: Jersey City, Chicago, Kansas City

Please address all correspondence to main office.

Do you have a Personal Subscription to

AGRICULTURAL CHEMICALS

There are numerous coming articles you will want to keep for your own. Why not enter your personal subscription today, if you've not already done so. One year for $3, two years $5, in the U. S.

AGRICULTURAL CHEMICALS

254 W. 31st St. New York 1, N. Y.

"COHUTTA"

POWDERED TALC

An excellent carrier for insecticides and fungicides. Produced by

Cohutta Talc Co.

Dalton - - - Georgia

all food crop residue must be controlled, and the result is a complex problem.

It is axiomatic that the case for the need of agricultural chemicals on crops will be made clearly and, it is hoped, with finality, by the several witnesses at the hearings. In one sense, it would seem that this phase of the proceedings would be superfluous. We might assume that no one could question the fact that our national food supply is dependent upon the control of the innumerable insects and diseases which prey upon our crops. Yet there are those who have yet to realize that the basic question is not, are these materials necessary, but rather how may they be more effectively and safely used?

No intelligent chemical manufacturer by choice would put material of a deleterious nature on foods which will be eaten by ourselves or by our children. Every farmer must grow crops in spite of the pests which seek to destroy them or he can no longer be fed. Therefore, the cooperative approach to the tolerance problem is a sound and necessary one.

The automobile, dynamite, fire and kindred servants of mankind are definitely harmful and lethal when used improperly. Agricultural chemicals, when used intelligently and in accordance with the rules developed by experience, are essential to the continuance of our civilization. Naturally their used is hedged by various precautions, as is true in our use of fire, dynamite, and the automobile. But used with proper precautions, they present no greater hazards. The need, in this connection, is for a long-range program of public education to insure a safer and more effective use of agricultural chemicals. The National Agricultural Chemicals Association is already moving to intensify its efforts in this direction.

The decision of the Food and Drug Administration to hold hearings on tolerances is generally welcomed by the insecticide industry. The manufacturers generally welcome the opportunity to clarify the question of tolerances on food crops for the benefit of their customers and the public.

We are in agreement that we are concerned with a public health and a public safety problem which deserves to be resolved by cooperative action on the part of all interested groups and agencies on a fair, intelligent and practical basis. It is encouraging to learn from the Food and Drug Administration that neither the users of agricultural chemicals nor the chemicals themselves will be on trial in the hearings. There is no plaintiff, no defendant and no jury, as such. As already indicated, we shall be concerned with a problem of public health and public service. Product groups within the industry are making preparation for the hearings.

In fewer words, the agricultural chemical industry recognizes the necessity for bringing to the hearings a combination of hard work, fair play and cooperation. All these elements are necessary if the hearings are to serve the purpose of advancing agricultural pest control and safeguarding public health. In both of these, the industry and agriculture has a vital interest.

QUINONES

(*Continued from Page 27*)

"Spergon." It is a crystalline yellow solid but is marketed as a finely ground powder for agricultural use. It is insoluble in water, but on standing, imparts a violet color to the supernatant solution due to traces of its hydrolysis product, chloranilic acid. The hydrolysis rate is markedly increased by alkali, but the compound is stable to acid. It is only slightly soluble in the common organic solvents but can readily be purified by sublimation. The melting point in a sealed tube is 290° C. (19).

Since this material was the first effective non-metallic, organic seed protectant (5) it aroused considerable interest and, as a result, has been evaluated by numerous experiment station workers both in the U. S. and abroad. It has been found useful in the treatment of a variety of seeds to prevent decay and damping-off, and has been recommended for use on peas (22, 49), lima beans (6, 37), corn (43, 36), peanuts (58), sorghum (8), vine crops and other seed (17). One of its features is its compatibility with nitrogen-fixing bacteria often used as legume inoculants.

In tests run at Conesville, Iowa, treatment of three hybrid corn varieties produced an average increase in yield of 36.6% (48). Similar tests in New York State on Golden Cross Bantam sweet corn gave an increase in yield of 19% (37), on lima beans, 33.3% (36), on machine shelled peanuts on 14 different farms in Virginia an average increase in stand of 66.6% (56) and on sorghum in Nebraska, 45% along with complete smut control (34).

Seed sweet potatoes dipped in a "Spergon" suspension gave an increase in sprouts of 9.6%. Sprouts dipped at the time of planting had 7% stem rot at harvest and yielded at the rate of 324 bushels per acre as compared to 55% stem rot and 198 bushels per acre for the check (10). It also has been recommended as a spray or dust to control downy mildew of cabbage (9, 14).

In addition to being an active fungicide, "Spergon" has certain other valuable properties. It is substantially non-toxic, as shown in tests conducted by McGavack and his associates of the New York Medical College (42). These indicate that it can be used as a seed protectant without danger to those who work with it. In feeding tests with swine (39) it was found that seeds treated with an excess dosage could be fed to these animals as an exclusive diet for long periods of time without injury. Whitney (57) has also shown that it is safe to use to control skin diseases of dogs. It is noninjurious to seed. Overdosages do not affect viability and treated seed can be stored for long periods without injury or loss of fungicidal value. In addition it serves as a natural lubricant, allowing the seed to flow more freely through the planter, and its physical properties are such that it adheres well to the seed.

PYROPHYLLITE

Ideal As A

DILUENT

AND

CARRIER

FOR

INSECTICIDES

•

CAROLINA PYROPHYLLITE COMPANY

10 EAST 40th ST. NEW YORK 16, N. Y.

Plants and Mines Located at

STALEY, N. C. and GLENDON, N. C.

Ask for Our Pamphlet

KRAFT BAG CORPORATION

HEAVY DUTY MULTI-WALL

SHIPPING SACKS

OPEN-MOUTH VALVE-TYPE

PASTED AND SEWN

including flat tube valve bag

KRAFT BAG CORPORATION

630 FIFTH AVENUE, NEW YORK 20, N. Y.

MILLS AT GILMAN, VT.

MONARCH WEED SPRAYS

Note these features:

1. Removable tip and strainer assembly. Unnecessary to disturb pipe connection for cleaning or changing sizes.
2. Milled flats tell direction of flat spray by "feel."
3. Threaded strainer cannot jar loose from vibration.
4. Produce absolutely uniform spray from edge to edge—no "end jets" to cause uneven coverage.
5. High velocity "non-fogging" penetrating sheet—an important factor where there is any wind.
6. Uniform capacities because of accurate machining.
7. Long straight wall orifice for extra wear—no "feather" edges to wear away quickly.
8. Built in strainer—largest screen opening less than half the diameter of the smallest orifice size.

MONARCH MFG. WKS. INC.

3406 MILLER ST. PHILA. 34, PA.

Western Distributor: W. A. Westgate, Davis, Cal.

PARIS GREEN

Dow Chemical Co. Brand

•

Packed 12 x 4 lb. tins per case

Carload and L.C.L. Quotations on request

•

BARCLAY CHEMICAL COMPANY INCORPORATED

75 Varick St. New York City

WOrth 4-5120

"Spergon" is formulated for use both as a dust and slurry treatment of seed. The addition of small amounts of DDT controls insects in the treated seed. It is interesting to note that while DDT alone affects viability of seed adversely, the addition of "Spergon" corrects DDT injury and the combination has found general use.

Several sensitive tests have been developed for the analysis of "Spergon" which permit quantitative determinations of this compound even at the low dosages employed in practice. These are of considerable importance both to scientists and practical agriculturists and have been equally useful in the control of manufacturing operations and formulations.

Although "Spergon" is sufficiently colored in solution to permit direct colorimetric estimation in some cases, Burchfield and McNew (2) have described an even more sensitive color test based on its reaction with acetone and diethylamine. By their procedure as little as five grams of seed treated at the rate of one ounce per bushel (0.1% by weight) may be analyzed accurately for "Spergon" content.

Burchfield and his associates (1) have also described the determination of particle size distribution and a method of obtaining agricultural dusts of uniform particle size using "Spergon" as one of the test materials. In the first of these two papers they describe a polarographic method which will permit the analysis of "Spergon" in foliage spray deposits where colored plant extracts might interfere with the colorimetric procedure.

Tables IV, V, and VI present some representative data on "Spergon" as a seed treatment material.

"Phygon"

THE first announcement of 2, 3-dichloro-1, 4-naphthoquinone as a fungicide was made by terHorst and Felix (53) in 1943. "Phygon" is a crystalline yellow solid melting at 196°C. Its solubility in organic solvents at room temperature is of the order of a few percent, and its solubility in water is about one part in ten million. Like "Spergon," it hydrolyzes in alkali, but at an appreciably slower rate. It is also considerably more light stable than "Spergon."

TABLE VII

Control of Scab on McIntosh Apples in Commercial Orchard, Woodbridge, Connecticut — 1948

Treatment	Rate lbs./100 gal.	% Scab Foliage	% Scab Fruit
"Phygon-XL"	1½	0	0
"phygon-XL"	¾	0	8
"Phygon-XL"	½	1	18
"Phygon-XL"	⅜ plus sticker	0	8
Ferric dimethyl dithiocarbamate (70%)	1½	5	18
Wettable Sulfur	8	8	23
Check			99

TABLE VIII

Results of Potato Foliage Spray Test with Phygon, Bethany, Connecticut — 1948

Treatment	Dosage lb./100 gal.	Late Blight % Foliage Infection August 29	Late Blight % Foliage Infection September 12	Yield bu./Acre
Phygon-XL	1	16	27	464
Phygon-XL	½	33	79	411
Check	—	66	99	377

"Phygon" was first prepared by Grebe (18), but it assumed little industrial significance until its fungicidal powers were discovered. It was used to some extent as an intermediate for dyestuff manufacture in Germany during the war, but in the U. S. its only commercial use has been as a fungicide.

For general purpose fungicidal applications, Phygon is one of the most potent organics yet discovered. The Fungicide Committee of the American Phytopathological Society in its "Summation of Nation Wide Results with New Fungicides" in 1947 states in its report on apple scab control, that of the materials used most, "Phygon" was consistently the best on the basis of fungicidal performance (15). In the 1948 tests (15a) "Phygon" also gave good fungicidal performance but was not given a general recommendation because of plant injury and dermatitis sometimes experienced with this compound.

A careful study of these practical deficiencies of "Phygon" has led to a new, improved formulation of the material containing 50% 2, 3-dichloro-1, 4-naphthoquinone on a magnesium sulfate base. This formulation, distributed as "Phygon-XL," is fully as effective as a foliage spray as the original material. Limited testing in 1948 followed by widespread evaluation during 1949 has shown that "Phygon-XL" can now be used safely and effectively on most plants. It is compatible with DDT and other solid non-alkaline insecticides, but causes burning when mixed with oils. It can be dispersed to form a stable paste in water or can be mixed with talc, pyrophyllite and similar materials. Certain clays with high base exchange capacity should be avoided.

In addition to controlling apple scab (31, 47), "Phygon" is effective on a number of plant diseases including bitter rot of apples (6), brown rot of stone fruits (7), late blight of potatoes and tomatoes (35, 44), cherry leaf spot (54) and many others. Commercial control of these diseases is often obtained with dosages as low as ¼ pound of active ingredient per 100 gallons of water.

As a seed protectant, "Phygon" is effective for a variety of crops including corn, beets, sugar beets, peas, swiss chard, peanuts, rice and others at dosages ranging from ¼ to 1 ounce per bushel of seed. As with "Spergon" and certain other organics, treatment can be made well in advance of planting without fear of injury. The development of such fungicides has given the farmer a safe form of crop insurance. At

fungicide costs ranging from a few mils to a few cents per acre he can now insure uniform germination and even stands of most commercial plantings.

Like "Spergon," "Phygon" has the advantage of being a nonpoisonous compound. Tests have been conducted by the New York Medical College (45) to determine its acute toxic action using rats and rabbits as the experimental animals. The LD50 against rats was 2.25 grams per kilogram of body weight. Topical application to the eye and skin of rabbits produced no systemic manifestations. According to the investigators, these tests indicate that 2,3-dichloro-1, 4-naphthoquinone offers no serious hazard of an industrial nature. As is true with organic compounds in general, occasional individuals prove to be susceptible to skin irritation from "Phygon" and develop symptoms similar in appearance and duration to that of sunburn. Protective creams based on glycerol are quite effective in minimizing this effect, but formulations containing oils or lanolin enhance irritation.

Tables VII, VIII, and IX give some representative data on "Phygon" as a foliage spray and seed protectant.

TABLE IX
Seed Treatment Tests with Phygon, Bethany, Connecticut — 1947
(Greenhouse Cold Tests)

CORN

Treatment	Dosage Oz./100 lb. seed	% Emergence
Phygon	4.8	73.0
"	2.4	74.0
"	1.2	73.5
Check	—	22

PEAS

Treatment	Dosage Oz./100 lb. seed	% Emergence Greenhouse Cold Tests	Field
Phygon	4.8	79.0	87.3
"	2.4	81.5	89.3
"	1.2	79.5	92.3
Check	—	9.0	70.0

BEETS

Treatment	Dosage Oz./100 lb. seed	No. of plants emerging from 400 seed balls Greenhouse Cold Tests	Field
Phygon	8	588	548
"	4	280	530
"	2	55	426
Check	—	56	238

SPINACH

Treatment	Dosage Oz./100 lb. seed	No. plants emerging from 250 seed
Phygon	8	123
"	4	125
"	2	125
Check	—	16

A convenient colorimetric method for the analysis of "Phygon" on seed has been developed by Burchfield and McNew (3), which is a modification of the procedure described previously for "Spergon." Burchfield and his associates (1) have also described a polarographic procedure by which "Phygon" can be analyzed in the presence of sulfur, DDT, rotenone and inorganic diluents, all of which are constituents of a commercial insecticide-fungicide mixture.

Acknowledgement

The authors are indebted to George L. McNew, George E.

Results---

You get them quickly from this magazine's

CLASSIFIED ADVERTISING

Meet your prospects at the industry's market place each month on the classified page of

Agricultural Chemicals

254 W. 31st St. **New York 1, N. Y.**

STATEMENT OF OWNERSHIP

Statement of the ownership, management, and circulation required by the Act of Congress of August 24, 1912, as amended by the act's of March 3, 1933, and July 2, 1946 (Title 39, United States Code, Section 233) of Agricultural Chemicals, published monthly at Baltimore, Md., for October 1, 1949.

1. The names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Industry Publications, Inc., 254 W. 31st St., New York, 1, N. Y.; Editor Lawrence A. Long, 254 W. 31st St., New York, 1, N. Y.; Managing Editor, Wayne E. Dorland, 254 W. 31st St., New York, 1, N. Y.; Business Manager, Thomas Morgan, 254 W. 31st St., New York, 1, N. Y.

2. The owner is: (If owned by a corporation, its name must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual member, must be given.)

Industry Publications, Inc., 254 W. 31st St., New York, 1, N. Y.; Ira P. MacNair, 254 W. 31st St., New York, 1, N. Y.; Wayne E. Dorland, 254 W 31st St, New York, 1, N. Y.; James Duncan MacNair, 242 Veterans Pl., Ithaca, New York.

3. The known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. Paragraphs 2 and 3 include, in cases where the stockholders or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

5. The average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was: (This information is required from daily, weekly, semiweekly, and triweekly newspaper only.) .....

(signed) WAYNE E. DORLAND, Publisher

Sworn to and subscribed before me this 28th day of September, 1949.

HARRIET LEVINE

(My commission expires March 30, 1950.)

O'Brien and Norman K. Sundholm for their contributions to this work.

Literature Cited

(1) Burchfield, H. P., *et al.*, Papers Presented at 113th A.C.S. meeting, (1948).
(2) Burchfield, H. P., and McNew, G. L., *Phytopathology*, 38, 299-306, (1948).
(3) Burchfield, H. P., and McNew, G. L., Accepted for publication in *Phytopathology*.
(4) Colwell, C. A., and McCall, M., *J. Bact.*, 51, 659-70 (1946).
(5) Cunningham, H. S., and Sharvelle, E. G., *Phytopathology*, 30, 4-5 (1940).
(6) Dunegan, J. C., Roberts, J. W., and Goldsworthy, M. C., *Plt. Dis. Reptr.*, 28, 1035-37, (1944).
(7) Dunegan, J. C., and Goldsworthy, M. C., *Plt. Dis. Reptr.*, 32, 136-7 (1948).
(8) Dunlap, A. A., Rosborough, J. F., and Miller, E. A., *Texas Agr. Expt. Sta. Bull.* 132, (1947).
(9) Eddins, A. H., *Fla. Agr. Expt. Sta. Press Bull.* 633, (1947).
(10) Elmer, O. H., *Kan. Agr. Expt. Sta. Mimeographed Leaflet*, (1945).
(11) Erdman, *Ann.*, 48, 309, (1843).
(12) Feiser, L. F., and Feiser, M., "Organic Chemistry," Chapter 31, Boston, Heath & Company, (1944).
(13) Flynn, E. S., (To Anaconda Wire & Cable Co.), U. S. Patent 2,425,-791, (August 17, 1947).
(14) Foster, H. H., Miss. *Agr. Expt. Sta. Circular* 127, (1946).
(15) Fungicide Committee, Am. Phytopathological Co., *Plt. Dis. Reptr. Supplement* 176, (May 15, 1948); (15a) *Supplement* 181, (Mar. 15, 1949).
(16) Gonzales, F., *Science* 101, 494 (1945).
(17) Gould, C. J., *Plt. Dis. Reptr.*, 27, 594-601 (1943).
(18) Grebe, C., *Ber.*, 1, 36 (1867).
(19) Grebe, C., *Ann.* 263, 19 (1891).
(20) Gries, G. A., *Phytopathology*, 33, 1112 (1943).
(21) Horsfall, J. G., "Fungicides and Their Action," Chap. 14, Waltham, Mass., Chronica Botanica Co. (1945).
(22) Hutton, E. M., *Jour. Coun. Sci. and Ind. Res. Aust.*, 17, 71-4 (1944).
(23) Kagy, J. F., and Sloop, K. D., (To Dow Chemical Co.) U. S. Patent 2,430,432, (November 4, 1947).
(24) Ladd, E. C., (to U. S. Rubber Co.), U.S. Pat. 2,396,665 (Mar. 19, 1946).
(25) Ladd, E. C., (to U. S. Rubber Co.), U.S. Pat. 2,429,099 (Oct. 14, 1947).
(26) Ladd, E. C., (to U. S. Rubber Co.), U. S. Patent 2,435,500 (February 3, 1948).
(27) Ladd, E. C., (to U. S. Rubber Co.), U. S. Patent 2,435,501 (February 3, 1948).
(28) Ladd, E. C., (to U. S. Rubber Co.), U. S. Patent 2,435,499 (February 3, 1948).
(29) Ladd, E. C., and Harvey, M. P., (to U. S. Rubber Co.), U. S. Patent 2,430,722 (November 11, 1947).
(30) Ladd, E. C., Private Communication.
(31) Lathrop, F. H., and Hilborn, M. T., *Maine Agr. Exp. Sta. Bull.* 457, (1948).
(32) Leighton, P. A., and Dresta, W. F., *J. Am. Chem. Soc.*, 52, 3556-62 (1930).
(33) Little, J. E., Sproston, T. J., and Foote, M. W., *J. Biol. Chem.* 174, 335-42 (1948).
(34) Livingston, J. E., *Nebraska Agr. Expt. Sta. Plt. Pathology Progress Rept.*, No. 1, (1943).
(35) *Maine Agr. Expt. Sta. Bull.* 449, 262-351, (1947).
(36) McNew, G. L., *The Canner*, 96, (9), 12 (1943).
(37) McNew, G. L., *The Canner* 96, (8), 14 (1943).
(38) McNew, G. L., *The Canner*, 96, (12), 14 (1943).
(39) McNew, G. L., *Iowa State Coll. J. Sci.*, 22, 177-184 (1948).
(40) McCallan, S. E. A., *et al. Contrib. Boyce Thompson Inst.*, 4, 233 (1932); 9, 249 (1938); 10, 239 (1939); 12, 49 (1949); 12, 431, 451 (1942); *Phytopathology*, 33, 627 (1943).
(41) McCallan, S. E. A., and Wellman, R. H., *Contrib. Boyce Thompson Inst.* 13, 93, (1943).
(42) McGavack, T. H., *et al. Jour. Ind. Hyg. and Toxicology*, 25, 98-111 (1943).
(43) McLaughlin, J. H., *Plt. Dis. Reptr.*, 28, 64-76 (1944).
(44) Nagel, C. M., *Phytopathology*, 34, 1009 (1944).
(45) New York Medical College, Private Communication.
(46) Page, J. E., and Robinson, F. A., *Brit. J. Exptl. Path.*, 24, 88-94 (1943).
(47) Palmitter, D. H., *Phytopathology*, 38, 315 (1948).
(48) Reddy, C. S., Leaflet No. 1, Supplement No. 1, Committee Upper Miss. Valley Plant Pathologists (1943).
(49) Sharvell, E. G., Young, H. D., Jr., and Shema, B. F., *Phytopathology*, 32, 944-52 (1942).
(50) ter Horst, W. P., (to U. S. Rubber Co.), U. S. Patent 2,349,771 (May 23, 1944).
(51) ter Morst, W. P., (to U. S. Rubber Co.), U. S. Patent 2,349,772 (May 23, 1944).
(52) ter Horst, W. P., (to U. S. Rubber Co.), U. S. Patent 2,302,384 (Nov. 17, 1942).
(53) ter Horst, W. P., and Felix, E. L., *Ind. & Eng. Chem.*, 35, 1255-59 (1943).
(54) U. S. D. A., Report on Agricultural Experiment Stations for 1945 (1946).
(55) U. S. Dept. Com., O.T.S., "Manufacture of Chloranil at I.G.F.," P.B. 77377, Frames 2100-1 (1941-45).
(56) Vaughn, E. K., *Plt. Dis. Reptr.*, 28 (No. 21) (1944).
(57) Whitney, L. F., *Veterinary Med.* 42, 263-4 (1947).
(58) Wilson, C., *Alabama Agr. Expt. Sta., Leaflet* 23 (1947).

FERTILIZER

(*Continued from Page* 39)

tained in the survey included an acreage of each crop proportional to the acreage of that crop in the state, this method should give the correct total usage. Actually, the results for some states appeared to be wrong. Therefore the tonnages were recalculated with the N.F.A. data for percentage of acres manured and manure used per manured acre, but with the Crop Reporting Board data on acreages of each crop (14, 15, 17). This method gave practically the same total for most states but radically different and apparently more reasonable results for those states for which they appeared erroneous by the previous method. The revised figures are given in Appendix Table 3.

The percentages of the manure produced that were applied to harvested crops are given in Appendix Table 3. These values range from less than 1 percent in several southern states, to more than 50 percent in a few states in the North Central and Northeastern Regions. The percentages for southern states are low because farm animals are not confined, as a rule, in barns or pens where the manure can be collected. The manure application rates for the Mountain States and the Pacific States, except California, are not as reliable as

Appendix Table 4

Estimated[1] nutrient contents of the average farm manure applied to harvested crops, by regions.

Region	N *Percent*	P_2O_5 *Percent*	K_2O *Percent*
New England	0.56	0.32	0.49
Middle Atlantic	.57	.34	.50
South Atlantic	.55	.3	.48
East No. Central	.58	.3	.49
West No. Central	.61	.8	.50
South Central	.57	.2	.50
Western	1.19	90	1.03

[1] Average analyses for each type of farm manure in the region were first prepared from the available data in the literature. Then a weighted average for all manure was calculated with the tonnages of each kind of manure applied in 1947 in the respective regions as the weights.

those for other regions, because the number of questionnaries filled in was small. Both the percentage of crop land manured and the rate per acre are high in all northern states and low in southern states. The apparent high rate of utilization in Rhode Island may be due to the fact that some farmers in Rhode Island buy manure from dairy and poultry farmers in other states.

The tonnages of the 3 principal plant nutrients in manures that were applied to harvested crops were calculated by means of the analyses given in Appendix Table 4. Analyses representative of the composition of each kind of farm manure in the various regions were selected from the large volume of literature on this subject, and then averaged, using the consumption of each kind of manure in that region as weight. There are no analyses available for many of the states, so these regional figures were used for all of the states in the respective regions.

APPENDIX TABLE 5

Percentages of nutrients, removed from the soil by harvesting crops,[1] that were replaced by applications of commercial fertilizers, by farm manures, and by both fertilizers and manures, 1947, by States.

STATE AND REGION	NITROGEN [1]			TOTAL PHOSPHORIC OXIDE			POTASH		
	Fertilizers	Manures	Total	Fertilizers	Manures	Total	Fertilizers	Manures	Total
Maine	74	28	102	380	39	419	109	17	126
New Hampshire	13	42	55	97	55	152	15	27	42
Vermont	5	146	151	74	167	241	5	82	87
Massachusetts	52	145	197	218	164	382	46	80	126
Rhode Island	85	248	333	364	341	705	106	174	280
Connecticut	78	162	240	223	201	424	49	93	142
New England	45	100	145	210	125	335	52	58	110
New York	29	115	144	174	113	287	24	58	82
New Jersey	121	43	163	558	46	604	150	26	176
Pennsylvania	25	136	161	181	144	325	42	104	146
Delaware	59	88	147	271	81	352	136	85	221
Maryland	53	79	132	297	85	382	100	69	169
West Virginia	14	73	87	127	81	208	18	51	69
Middle Atlantic	34	112	146	207	115	322	43	72	115
Virginia	65	21	86	360	22	382	81	16	97
North Carolina	123	8	131	517	10	527	150	7	157
South Carolina	138	5	143	505	7	512	214	7	221
Georgia	131	8	139	410	8	418	179	9	188
Florida	334	15	349	1039	18	1057	344	10	354
South Atlantic	130	10	140	486	12	498	166	9	175
Ohio	17	74	91	150	78	228	54	71	125
Indiana	11	46	57	127	49	176	58	54	112
Illinois	5	71	76	146	71	217	18	81	99
Michigan	15	96	111	109	95	204	29	58	87
Wisconsin	5	140	145	73	152	225	19	91	110
East No. Central	10	82	92	126	85	211	32	74	106
Minnesota	2	61	63	25	79	104	6	69	75
Iowa	3	34	37	32	39	71	6	39	45
Missouri	7	42	49	79	39	118	11	29	40
North Dakota	0.2	7	7	3	11	14	1.1	13	14
South Dakota	0.1	11	11	2	17	19	0.2	17	17
Nebraska	1.1	10	11	3	13	16	0.03	11	11
Kansas	1.0	4	5	12	5	17	0.7	5	6
West No. Central	1.7	23	25	20	30	50	4	28	32
Kentucky	26	7	33	152	7	159	24	5	29
Tennessee	38	38	76	164	32	196	29	25	54
Alabama	117	5	122	443	5	448	157	6	163
Mississippi	119	1	120	132	2	134	52	2	54
East So. Central	73	12	85	206	12	218	49	10	59
Arkansas	47	12	59	87	12	99	28	11	39
Louisana	84	3	87	166	3	169	42	4	46
Oklahoma	1.2	3	4	19	4	23	1.3	5	6
Texas	9	1	10	44	1	45	8	1	9
West So. Central	15	3	18	50	3	53	11	4	15
Montana	0.4	30	30	11	32	43	0.05	27	27
Idaho	5	58	63	35	48	83	1.6	29	30
Wyoming	0.1	77	77	13	79	92	0.03	44	44
Colorado	3	38	41	12	42	54	0.4	32	33
New Mexico	4	0.2	4	57	0.2	57	0.3	0.1	0.4
Arizona	56	0.1	56	122	0.1	122	0.4	0.1	0.5
Utah	5	227	232	51	180	230	0.4	85	85
Nevada	0.6	0.1	0.7	6	0.1	6	0.04	0.04	0.1
Mountain	5	48	53	26	48	74	0.5	32	33
Washington	14	14	28	27	15	42	7	15	22
Oregon	19	9	28	51	10	61	7	7	14
California	91	29	120	82	28	110	12	13	25
Pacific	55	21	76	61	22	83	11	13	24
United States	21	38	59	98	44	142	27	36	63

[1] In the case of nitrogen, legumes are excluded because of their ability to obtain nitrogen from the air. The basic data, from which these results are obtained are resented in Appen. Tables 1, 2, and 3.

Industry Patents

2,484,295. N-Substituted Oxyacetamide Compounds and Insect Control Compositions. Patent issued October 11, to L. B. Kilgore, Washington, D. C., assignor, by mesne assignments, to Lowell B. Kilgore and Helen F. Kilgore, both of Washington, D. C. The N-substituted alpha-etherified acetamides having the general formula:

$$R—O—CH_2CO—NHR'$$

wherein R is an aralkyl and R' is an aliphatic hydrocarbon radical.

2,484,395. Nitrite Salts of Organic Nitrogen Bases. Patent issued October 11, to Aaron Wachter and Nathan Stillman, Berkeley, Calif., assignors to Shell Development Co., San Francisco. The nitrite salts of six-membered heterocyclic amines containing within their cyclic structure an oxygen atom, an amino nitrogen atom, and four saturated carbon atoms, the oxygen atom and the amino nitrogen atom being in the 1,4 position relative to each other, and at least one carbon atom being substituted with an alkyl group.

Trade Mark Applications

FAESY & BESTHOFF, INC., white letters on black shield, with initials, "F. B." in background, for insecticide. Filed June 18, 1948, by Faesy & Besthoff, Inc., New York. Claims use since May 19, 1948.

QUAKERAL, in capital letters, for furfural. Filed July 28, 1948, by Quaker Oats Co., Chicago. Claims use since March 31, 1948.

DR. S., with cross, surrounded by periphery of letters spelling out "Dr. Salsbury's Laboratories, Charles City, Iowa, U. S. A.," for insecticides, herbicides, rodenticides, fumigants, etc. Filed April 30, 1948, by Dr. Salsbury's Laboratories, Charles City, Iowa. Claims use since April 28, 1948.

LAMBRAND, in capital letters, for sulfur. Filed Jan. 10, 1948, by Food Machinery Corporation, San Jose, Calif. Claims use since Oct. 21, 1947.

SEE-JAY, white capital letters on black oval background, for insect exterminating powder. Filed Sept. 27, 1948, by See-Jay Exterminating Service, Inc., Oklahoma City, Okla. Claims use since Oct. 5, 1945.

TOXERONE, in hand lettered capitals, for spray-type liquid insecticide. Filed Sept. 30, 1948, by Nash & Kinsella Laboratories, Inc., St. Louis, Mo. Claims use since Feb. 8, 1948.

CIRCLE WITH VERTICAL LINES DRAWN INSIDE, for hydrated lime, hydrated dolomite and phosphatic fertilizers. Filed Mar. 9, 1948, by the Permanente Metals Corp., Oakland, Calif. Claims use since Sept. 30, 1944.

VIRDANS, in capital letters, for fertilizer for house plants. Filed Mar. 18, 1948, by Virdans Farms, Phelps, N. Y. Claims use since Feb. 9, 1948.

3-IN-ONE, in capital letters, and also a numeral, one, with legend, "3 in" printed inside, for chemical fertilizer. Filed Apr. 1, 1948, by Boyle-Midway, Inc., Jersey City, N. J. Claims use since Jan. 29, 1948.

RAMCO, in capital letters, in arc shape, for agricultural minerals. Filed July 19, 1948, by Randall Mills Corp., Paramount, Calif. Claims use since Jan. 2, 1948.

RAMCO, in shaded capital letters with circle underneath, containing drawing on ram's head, name of firm, and the slogan, "Leaders in Quality," for agricultural minerals. Filed July 19, 1948, by Randall Mills Corp., Paramount, Calif. Claims use since Jan. 2, 1948.

GP, in capital letters, for insecticides, germicides, fungicides and insect repellants. Filed Aug. 7, 1948, by R. P. Scherer Corporation, Detroit, Mich. Claims use since October, 1933.

•

Howard C. Lisle Dies

Howard C. Lisle, pioneer in the development of farm machinery with John Bean Division of Food Machinery & Chemical Corp., died October 12 in Lansing, Mich. At the time of his death, he was vice-president in charge of agricultural divisions of the parent corporation. He had been manager of the John Bean Division for 31 years, before being named vice-president in 1946.

•

Powell Expands on Coast

New facilities for the distribution of insecticide concentrates on the Pacific Coast have been set up by John Powell & Co., Inc., insecticide manufacturers. H. Alvin Smith, Executive Vice President of the Company, announced upon his return from California the appointment of Nassau Chemicals, Inc., 420 Market Street, San Francisco, California, as Powell's Pacific Coast representative.

A new manufacturing plant and warehouse was recently opened in Huntsville, Alabama, to supplement the plant and warehouse in Brooklyn, New York. Additional warehousing facilities in Fort Worth, Texas; Denver, Colorado; and now San Francisco, put Powell in a position to serve as a source of supply to insecticide manufacturers from coast to coast. Offices in New York, San Francisco, Huntsville, Chicago, Denver, Fort Worth, Pittsburgh and Philadelphia provide sales and service coverage.

•

Naugatuck Offers Miticide

The name, "Aramite," has been selected by Naugatuck Chemical Division of U. S. Rubber Company for its new miticide, the company has announced. The product has been tested extensively in the field during the past two seasons under the code, "88R," and has shown specific promise for the control of mites. The material is stable, has a long residual effect, and is characterized by a low order of mammalian toxicity, the announcement states.

In the greenhouse, "Aramite" at a dilution of 1 to 100,000 gives 100% mortality of the greenhouse red spider mite. In field tests "Aramite-15W," the 15% wettable powder, at 1 pound per 100 gallons controls many different species of mites on such crops as apples, cotton, citrus and ornamentals. The formulation is non-phytotoxic and is compatible with commonly used insecticides and fungicides. It will be available for limited sale in 1950, a company spokesman stated.

•

MGK Appoints Reek

McLaughlin Gormley King Co. of Minneapolis, Minnesota, has announced the appointment of Lloyd D. Reeks, Jr., as their representative to cover the states of California and Arizona. Following his service with the Army Air Force, Mr. Reeks was associated with the Wilson & Geo. Meyer & Co. in their Los Angeles office. He will make his headquarters at LaCanada, California.

Classified Advertising

Rates for classified advertisements are ten cents per word, $2.00 minimum, except those of individuals seeking employment, where the rate is five cents per word, $1.00 minimum. Address all replies to Classified Advertisements with Box Number, care of AGRICULTURAL CHEMICALS, 254 W. 31st St., New York 1. Closing date: 25th of preceding month.

Positions Open

Sales Manager: Wanted by well-known mid-west manufacturer and marketer of small package insecticides and allied specialties to department, chain, hardware, etc. stores. Man of high-caliber with broad sales experience in this field is required, particularly knowing buyers, buying habits, etc. Give full details in complete confidence. Address Box 393 care of Agricultural Chemicals.

Position Open: Some territories open for brisk selling chemical Cesspool and Septic Tank Cleaner. Saves pumping and digging. Results guaranteed. For resale trade. Substantial commissions. Our sales on this worthy product have been increasing regularly for the past 10 years. Full or part time. Address Box 399 care of Agricultural Chemicals.

Wanted: Young man with educational background in agricultural chemicals and some experience in the industry for the agricultural department of large chemical manufacturer. Inside position at first, sales work later. Excellent opportunity. Outline experience, education, etc. in letter. Address Box 394 care of Agricultural Chemicals.

Available Jan. 1950: America's fastest growing agricultural chemical company has openings available January 1, 1950, for qualified industrious serious minded men who desire a real future. Must have car and be able to support self first month on road. Average earning 10 to 20 thousand per year. Address Box 401 care of Agricultural Chemicals.

Positions Wanted

Plant Pathologist: Ph.D., 30, married, 5 years academic teaching and research; 2 years experience directing industrial research and development. Knowledge administration, advertising, labeling of fungicides, herbicides, insecticides, aerosols. Field experience and liaison with station workers and growers. Desires permanent research and/or administrative position with chemical manufacturer or institute. Kindly reply to Box 395 care of Agricultural Chemicals.

Organic Development Chemist: 4 years excellent experience in process development of insecticides and fungicides—DDT, 2, 4-D, 2, 4, 5-T, synthetic pyrethrins, pentachlorophenol, benzene hexachloride, etc.—seeks development or sales position with future. Address Box 396 care of Agricultural Chemicals.

Agricultural Chemical Salesman: B.S. degree in agriculture, desires a new connection in sales or management. Experience is based on a practical farm background, labor management, and a proven record of large volume sales to distributors, compounders etc. in the east. Address Box 397 care of Agricultural Chemicals.

Miscellaneous

Manufacturing Facilities: Large manufacturer in mid-west offers modern facilities for mixing, milling, packaging, etc. of chemicals, specialties, etc. Can handle large additional volume. Pack various size boxes, cartons, bags, drums. Opportunity for East or West Coast firm to manufacture low cost in mid-west. Can ship rail or own trucks. Full laboratory control. Experienced personnel. For further details, write Box 398 care of Agricultural Chemicals.

Available Now Exclusive Territorial Franchise for America's fastest growing agricultural chemical and insecticide line. Protected investment of $25,000 to $50,000 required. Intensive advertising support. West Coast most midwestern and southern states open. Address Box 400 care of Agricultural Chemicals.

For Sale

For Sale: About 300 gallons of Dithane D-14 in drums of 50 gallons $1.50 per gallon F.O.B. Los Angeles, Calif. J. Goldman, 2903 Beverly Blvd., Los Angeles, Calif.

For Sale: Buffalo Turbine Mist Sprayer—Duster Trailer Model used only thirty hours as demonstrator. Perfect condition. Sacrifice! Write—Pest Control Supply Company, 6164 Santa Monica Blvd., Hollywood, 38, Calif.

FLORIDA FIELD TRIALS

Testing agricultural chemicals in the field during the winter months.

DR. G R. TOWNSEND

P. O. Box 543

Belle Glade, Florida

CONSULTING ENTOMOLOGIST

Insecticides — Formulation
Plant Pathology—Research
Entomology—Legal Service

Author of "Chemistry & Uses of Insecticides"

DR. E. R. de ONG

926 Stannage Ave., Albany 6, Calif.

ALVIN J. COX, Ph.D.

Chemical Engineer and Chemist

(Formerly Director of Science, Government of the Philippine Islands. Retired Chief, Bureau of Chemistry, State of California, Department of Agriculture.)

ADVISER ON AGRICULTURAL CHEMICAL PROBLEMS AND INVESTIGATIONS

Consultant in reference to spray injury and damage, claims, including imports of fruits and nuts, formulas, labeling, advertising and compliance with law.

1118 Emerson Street
Palo Alto, California

Research • Development • Analysis

Bacteriology
Chemistry
Toxicology
Pharmacology

Industrial Specialists

Scientific Associates, Inc.

1474 S. Vandeventer Ave.
St. Louis 10, Missouri

Eastern AAEE to Meet

The Eastern Branch of the American Association of Economic Entomologists will hold its 21st annual meeting at the Lord Baltimore Hotel, Baltimore, Md., November 21 and 22, according to Dr. B. F. Driggers, Rutgers University, secretary-treasurer of the group.

The meeting program had not been announced at press time, since the deadline for paper titles was November 5; but Dr. Driggers indicated that perhaps 40 papers may be presented at the convention. Officers of the Branch, in addition to Dr. Driggers, are: Dr. Frank C. Nelson, Roselle, N. J., chairman; and Edwin Gould, Kearneysville, W. Va., vice-chairman.

Wenatchee Meeting

Washington state's first annual Aerial Dusting and Spraying Conference was held October 20-21 at Wenatchee. Sponsors of the event were the State Aeronautics Commission, the State Department of Agriculture and the Institute of Agricultural Sciences, State College of Washington.

No officers were elected, and, according to Dr. H. S. Telford, Pullman, Wash., the Conference has no fees, no by-laws nor established precedents; the group being composed of persons interested in agricultural aviation concerning the application of agricultural chemicals, seeding by air, etc.

George D. Childress, chief, C.A.A., Washington, D. C., told the group that education, rather than regulation, is the answer to problems surrounding the safe and effective use of airplanes in agriculture, which he said represents the fastest growing phase of aviation at the present, with some 5,000 aircraft thus engaged. Mr. Childress said that good equipment, safe working conditions, proper training, a code of ethics, and respect for the property of others is essential to success in custom operations.

Movies were shown by H. H. Hessig, U.S.D.A., Forest Grove, Oregon, to demonstrate proper methods for control of pea aphid. Don Larson, Yakima, Washington, discussed the fundamentals of economic entomology, emphasizing control of common pests.

D. H. Brannon, Washington State College, presented figures on codling moth control for 1948 and 1949, showing improvement in the latter year. The percentage of wormy apples in 1949 ranged from zero to 2%, with costs per acre varying from $66 to $119 per acre he said. The 1948 figures showed less control at higher cost. DDT was used both years.

Harold Schaad, Grandview, Wash., discussed airplane spraying to control aphids and flea beetles, stating that by killing the aphid vector, potato leaf roll may be controlled. A colored sound movie of operations in Northern Idaho to control the douglas fir tussock moth, was shown by James C. Evenden, U. S.D.A.

Reactions of a fieldman to plane application of insecticides were described by Marvin Broulette, Cashmere, Wash. He suggested improvements in technique, emphasizing need for ideal weather conditions. Timing is of utmost importance, he said, and pointed out that airplanes make this possible.

Lowell Rasmussen, Washington State College and W. H. Farmer, Bureau of Reclamation, discussed weed control along ditch banks and in fields; Richard Bullock, W.S.C., told of aerial application of hormones; Roderick Sprague, also of W.S.C., stated that more care must be taken with fungicides than insecticides, because of larger volume of materials used.

Legal aspects were aired by S. N. Omdahl, Washington State Dept. of Agriculture.

Advertisers' Index

Unknown?

ARE your salesmen, your firm, your products unknown? Do your salesmen arrive at the purchasing agents' offices unheralded and unsung? Do they receive that cold, vacant stare from buyers?

No! Not if you have paved the way with sensible, factual advertising in the industrial press in advance of their calls. Now, for example, if it be in the field of chemicals for agriculture, where you want to prepare the way for your salesmen, we suggest regular advertising in

AGRICULTURAL CHEMICALS

254 WEST 31st STREET **NEW YORK 1**

TALE ENDS

From our friend T. J. McKee, Fruitgrowers Chemical Co., Ltd., Port Napua, New Zealand, comes a story of weed control used in New Zealand areas which are inaccessible to mechanical ground application rigs.

A light gasoline-driven compression unit is mounted on the back of a farm horse, with two eight gallon tanks suspended one on each

"One-hoss spray . . ."

side of the animal. Thus equipped the steed may be led along steep hillsides with two men working a fifteen-foot spray boom carried in front of the horse.

•

Reactions to a given stimulus seem to differ widely with various persons. Take, for instance, the reaction to our recent article on the role of helicopters in agriculture. We heard a number of favorable verbal comments, and received some letters of approval.

But also comes a caustic comment from a west coast subscriber in a telegram which says, in part, "Why clutter up an otherwise excellent magazine with this helicopter malarky. According to farmers in this area, two mules, two drunken nationals with broken shovels on fertilizer wagon are superior to helicopters."

(We have written the sender of the telegram for more details)

PRINTED BY WATKINS PRINTING CO., BALTIMORE

Available Now!

Fumigants and Insecticides of Tested Reliability For Your Requirements

Dow fumigants and insecticides are backed by many years of research and testing in Dow Laboratories, plus wide use in every field of pest control.

DOWFUME 75

(Ethylene Dichloride 75% and Carbon Tetrachloride 25% by volume)

An all-purpose grain and spot fumigant mixture.

DOWFUME EB-5

(Ethylene Dibromide 5% by volume)

For use in farm or large elevator bins . . . penetrates all levels of the bin . . . controls pests in surface layers of grain.

DOWFUME EB-15

(Ethylene Dibromide 15% by volume)

For local mill machinery and spot fumigations.

DOWKLOR FORMULATIONS (Chlordane)

Combine contact, fumigant and stomach poison action to most crawling insects. Three formulations: DOWKLOR-5%-Dust, DOWKLOR-40%-Emulsifiable and DOWKLOR-40%-Wettable.

Your inquiries are invited.

FUMIGANT DIVISION

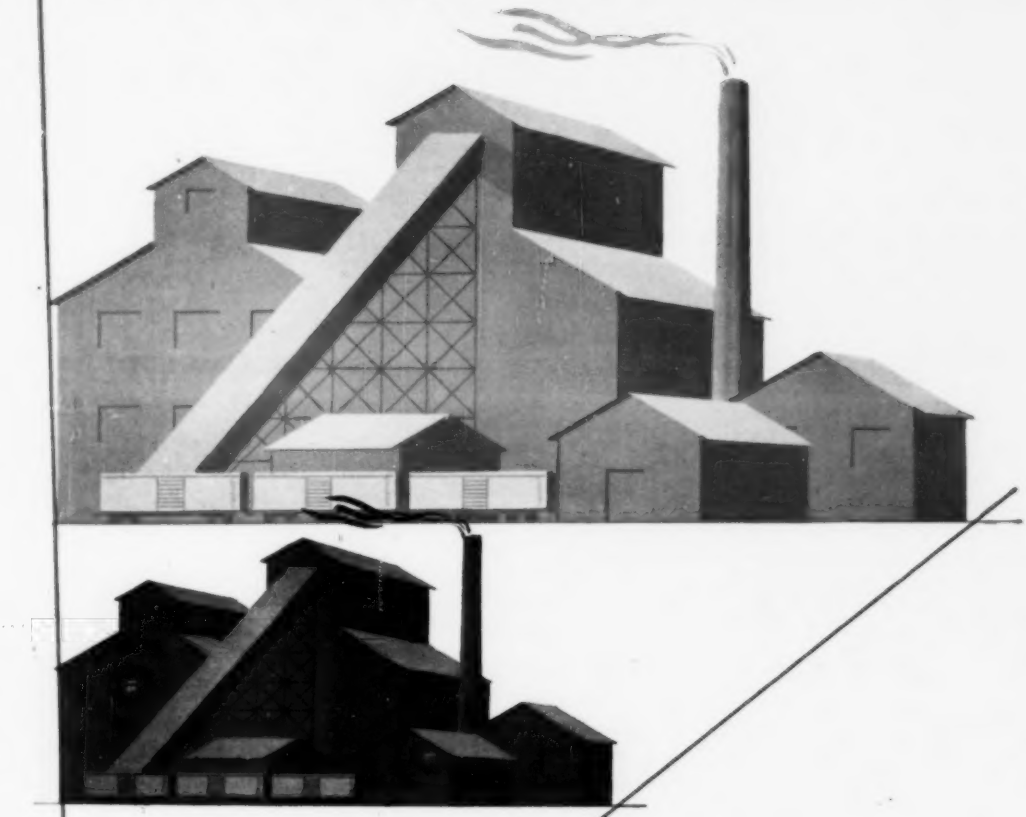
THE DOW CHEMICAL COMPANY · MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Cleveland • Detroit • Chicago
St. Louis • Houston • San Francisco • Los Angeles • Seattle
Dow Chemical of Canada, Limited, Toronto, Canada

DOW

CHEMICALS INDISPENSABLE TO INDUSTRY AND AGRICULTURE

more toxaphene for 1950



To meet the continually increasing demand for toxaphene (chlorinated camphene 67–69% Cl), Hercules has greatly expanded its production facilities at Brunswick, Georgia.

We urge insecticide manufacturers to place their orders early, so that production and distribution may be scheduled to meet requirements as they arise throughout the season.

HERCULES POWDER COMPANY
INCORPORATED
970 Market Street, Wilmington 99, Delaware

MAKERS OF TECHNICAL TOXAPHENE FOR AGRICULTURAL INSECTICIDES

NX9-35